

ANNUAL SESSION NUMBER

*Archives of*  
**PHYSICAL MEDICINE  
AND REHABILITATION**

(Formerly *Archives of Physical Medicine*)

*Official Journal*

*American Congress of Physical Medicine and Rehabilitation*  
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**JULY, 1954**

**NO. 7**

**ANNUAL SESSION • WASHINGTON, D.C. • SEPTEMBER 6-11, 1954**

# American Congress of Physical Medicine and Rehabilitation

32nd Annual  
**Scientific and Clinical Session**  
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# Contents — July, 1954

Volume XXXV

No. 7

## ARCHIVES OF PHYSICAL MEDICINE AND REHABILITATION

(Formerly Archives of Physical Medicine)

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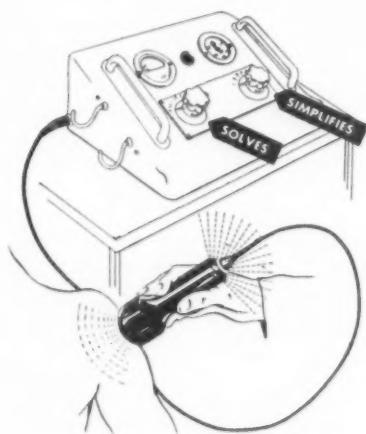
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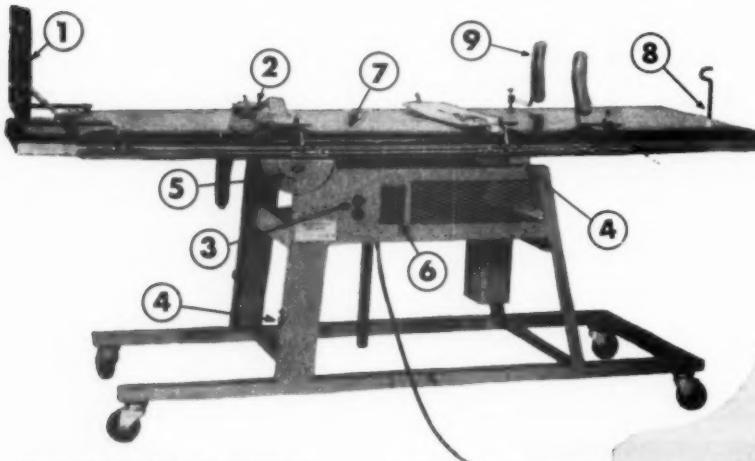
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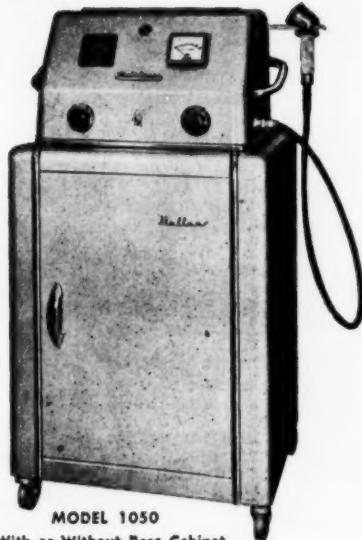
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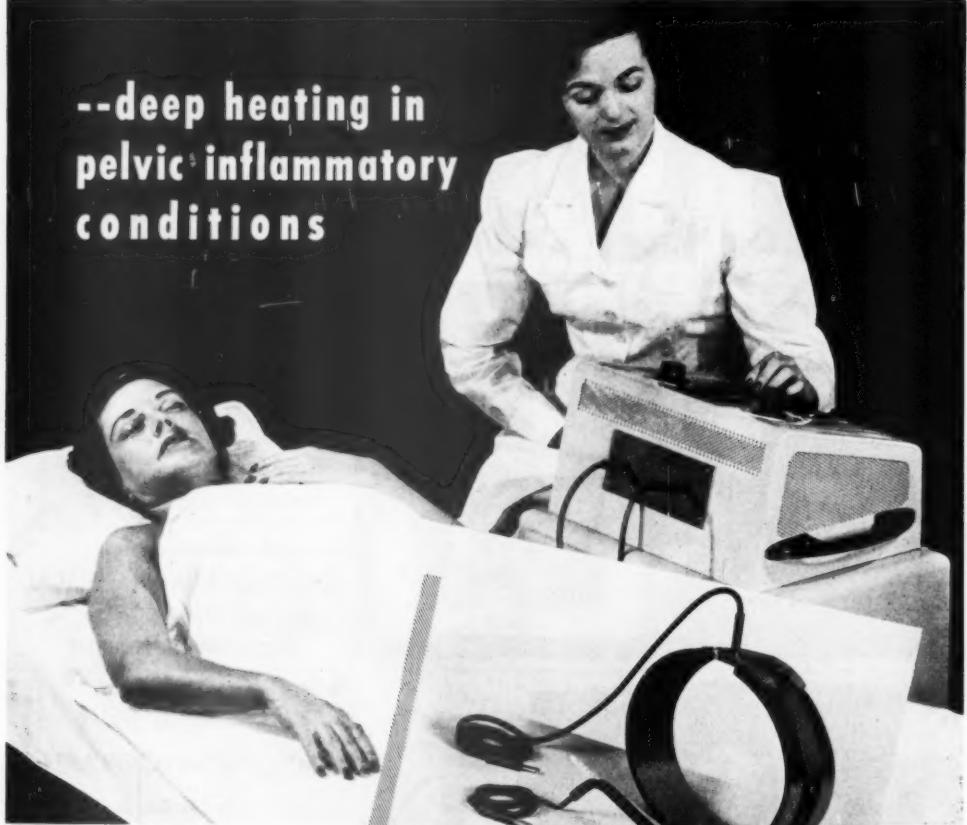
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## Method of AMA Residency Approval

Edward H. Leveroos, M.D.

Chicago

The procedure for approval of residencies in the medical specialties can be properly considered from the standpoint of the organization or organizations approving the training program. Thus we may consider approval procedures for residencies to which the Council on Medical Education and Hospitals of the American Medical Association extends official recognition; those approved by the Council in collaboration with the specialty board concerned and finally, those approved by the Council, the specialty board, and one of the other of the two Colleges; i.e., the American College of Physicians and the American College of Surgeons may be discussed.

The Council on Medical Education and Hospitals initiated an approval program in 1917 by publishing a list of hospitals considered qualified to provide adequate training for interns. A few years later, a list of "special hospitals" was added in which so-called "specialized training" was available. This list consisted primarily of neuropsychiatric institutions, tuberculosis sanatoria, children's hospitals, and hospitals for eye, ear, nose and throat conditions, where the young physician interested in these special areas of medicine could obtain added clinical experience with varying degrees of supervision and formal instruction.

At the present time, the Council on Medical Education and Hospitals independently approves programs in the following specialties and subdivisions of medicine: contagious diseases, malignant diseases, occupational medicine, ophthalmology and general practice residencies.

In these specialties, the Council approves training programs on the basis of an inspection made by one of its field representatives, independent of any other organization. In some of these

specialties, no board has been established which would have a direct interest in the training being provided. In others, the board concerned accepts the Council's appraisal without participating directly in the approval procedure.

Within the past fifteen years, the Council has established working arrangements with practically all specialty boards under which approval of a hospital for residency training is extended by joint action of the two organizations. At present, training programs in the following specialties are approved as a collaborative effort of the Council and the Board concerned: anesthesiology, dermatology-syphilology, neurological surgery, obstetrics-gynecology, orthopedic surgery, otolaryngology, pathology, pediatrics, physical medicine and rehabilitation, plastic surgery, preventive medicine, proctology, psychiatry, neurology, radiology, thoracic surgery and urology.

Programs in these specialties, as approved by the Council and the respective Board, are listed in the Internship and Residency Number of The Journal of The American Medical Association, published annually in the early fall. In many of these specialties, the number of years for which the hospital is accredited is included in listing the service, so that the prospective applicant will know how to plan his training program at the time he starts his residency work. In other specialties, the hospital is listed as approved without specifying the length of the approved training program. As a prefacing remark to these services, the statement is made that the Board will evaluate the training which the resident receives, on an individual basis.

Read at the Annual Session of the American Society of Physical Medicine and Rehabilitation, Chicago, August 31, 1953.

Associate Secretary, Council on Medical Education and Hospitals, American Medical Association, Chicago.

In two of the major divisions of medicine, internal medicine and general surgery approval is extended to hospitals for residency training by joint action of the Council, the Board and one or the other of the two Colleges; i.e., American College of Physicians and American College of Surgeons. The two committees which have been established to approve residency programs in these specialties are the Residency Review Committee for Internal Medicine with representatives from the American Board of Internal Medicine, the American College of Physicians and the Council; and the Conference Committee on Graduate Training in Surgery with representatives from the American Board of Surgery, the American College of Surgeons and the Council. The former committee was established shortly before World War II. It suspended its activities during the war and was reactivated in 1949. At present, all applications for approval of residency programs in internal medicine are referred to this committee for evaluation. In the medical specialties, allergy, cardiovascular diseases, gastro-enterology and pulmonary diseases, approval is granted as a joint action of the Council and the appropriate sub-specialty Board of the American Board of Internal Medicine. This committee and sub-committees have provided a most effective and satisfactory mechanism for bringing together in a cooperative effort the several organizations most directly interested in residency training in these areas.

A comparable group, the Conference Committee on Graduate Training in Surgery was established in the spring of 1950. It has met regularly since that time and has been responsible for developing uniform standards for graduate training in surgery having the approval of the three member groups; for the establishment of a single inspection procedure, and for the development of a list of residency programs approved by the several participating organizations. Lists of services approved through this Conference Committee are published in the Internship and Residency Number

of the *Journal* and in the *Bulletin of the American College of Surgeons*.

#### Review of Approval Procedures

The twenty-eight specialties and sub-specialties of medicine for which a hospital may now apply for approval, and the organizations participating in the approval program have been reviewed.

For purposes of clarity, the procedure followed in approving a hospital for residency training should be considered under the following headings: 1 Exploration; 2 Application; 3 Evaluation; 4 Notification, and 5 Publication.

While the exact steps by which a program becomes approved varies somewhat depending on the specialty, in general the procedure is about the same. The greatest variable in the procedure is the time lag between (1) exploration and (5) publication.

Briefly, the sequence of events in approving a residency program can be outlined as follows:

*Exploration*—At this stage, the hospital is interested in initiating a training program. Perhaps it might be more realistic in some instances to say rather that the chief of service is anxious to have a resident. In any event, he or the hospital administrator will write to the Board or to the Council office requesting information relative to the proper procedure in obtaining approval. A copy of "Essentials of Approved Residencies and Fellowships," which outlines the basic requirements for approval, as well as a copy of the "Internship and Residency Number" which contains in summary form, the training requirements of all approved examining boards in the medical specialties are then sent. The hospital is advised to complete an application form if the staff is of the opinion that requirements for approval can be met.

*Application*—On receipt of formal application, the proposed program is evaluated and if it seems apparent that the hospital can meet minimal requirements, it is scheduled for inspection by a member of the staff of the Council. In some instances, the information submitted by

the hospital indicates that a satisfactory program could not be developed. Such an application would be disapproved without further action. This preliminary screening is necessary since the average cost of visiting a hospital for purposes of evaluating its program is approximately \$100. Disapproval at this stage however, is decided upon only if it is quite evident that the hospital is unable to meet minimum requirements. In most instances, the hospital is scheduled for inspection which may follow receipt of the application in a matter of a few weeks or several months depending upon the itineraries of the field staff.

In the event the hospital is to be inspected, a copy of the application is forwarded to the secretary of the Board concerned to alert the Board to the fact that the program is under consideration. It is not expected that the Board will take action on the basis of this application, which contains limited information about the service and the proposed program.

The Board, however, may elect to obtain preliminary information about the hospital pending receipt of the inspection report and more detailed data about the service.

*Evaluation*—The evaluation of a hospital's teaching potential is obviously the most important, and at the same time, the most difficult aspect of the approval procedure. The method by which it is accomplished varies somewhat depending upon the specialty involved.

In all specialties, a representative of the Council conducts a basic inspection. When visiting the hospital, the field representative meets with the administrative head and under his guidance makes an overall survey of the hospital and its organization. The general educational program of the hospital staff is reviewed and if possible, one of the regularly scheduled educational activities such as a clinico-pathological conference is attended. Following his orientation to the hospital, the inspector will meet briefly with the radiologist and

pathologist to discuss the contributions of these two departments to the training program. The field representative will then meet with the hospital's residency committee or more frequently with the chief of the department and review with him the details of the proposed training program.

It may be considered pertinent to state at this point that while generally staff representatives do not attempt to judge the caliber of the professional work in the twenty-eight specialties and subspecialties for which approval is granted, nor of the qualifications of the individual heading the department, they can and do evaluate the training programs presented for approval. Since approval by either the Council alone, or in collaboration with other organizations, is presumably based on published requirements, it should not be considered impossible for a physician who is experienced in this work, and who has reasonably good judgment to be able to interpret a proposed training plan in the light of these standards and to come to a sound decision relative to the adequacies or inadequacies of the program. The evaluation of the professional work in the hospital and of the qualifications of the department head is largely a function of the committee approving the application whether this action be one of the Council and a Board, or of the Conference Committees in medicine or surgery.

On receipt of the inspection report, a copy together with pertinent data furnished by the hospital, is forwarded to the Board or Conference Committee. Consideration of the application by the Board may in some instances be by special committees established for that purpose. In other specialties, the full Board itself may have to take official action on the application. Following consideration by the Board or its designated committee, the program is submitted to the Council for consideration and necessary action. Thus the rather lengthy procedure from original inquiry to disposition of the application is completed.

*Notification* — Upon completion of

consideration by the Council and the Board or by one or another of the Committees referred to, the hospital is notified of the joint action taken. The hospital and the Secretary of the Board are notified simultaneously to avoid any misunderstanding as to the status of the program.

*Publication*—The final step in the approval procedure is the inclusion of the program in the Internship and Residency Number of the *Journal*. In surgery, the programs approved by the Conference Committee are also listed in the *Bulletin* published by the American College of Surgeons.

## A Study of Production and Evaluation of Muscular Hypertrophy

Rex O. McMorris, M.D.  
Columbus, Ohio

and

Earl C. Elkins, M.D.  
Rochester, Minn.

Muscular hypertrophy is an increase in muscle fiber circumference over normal. Without microscopic studies hypertrophy must be measured indirectly either by volumetric studies of an extremity, by caliper or by circumferential tape measurements. The increased area of the extremity at best is a rough estimate of hypertrophy of a muscle contained therein. DeLorme and associates<sup>1</sup> produced an increase in the circumference and strength of the arm and thigh by applying progressive resistance exercises to the biceps brachii and quadriceps femoris respectively. The circumferential increase was thought to be on a structural basis. The strength of these muscles increased considerably as measured by the one-resistance-maximum (the muscle load that can be lifted through full range of the joint once but not twice = 1 RM).

The objective of this experiment was to produce hypertrophy of the right triceps of normal subjects by progressive resistance exercises. In order to be reasonably certain that muscle fiber hypertrophy had been obtained, a measurable gross enlargement of the muscle was deemed necessary. Since muscular hypertrophy and increased strength are usually associated clinically, it seemed desirable to measure this concomitant

factor. The production and evaluation of increase in size and strength of the muscle presented problems that stimulated this report.

### Methods

Progressive resistance exercises as used clinically were applied over a twelve-week period to the right triceps brachii of twelve normal subjects, nine male and three female, aged 20 to 29 years. Circumference of the arm, body weight and isometric strength measurements were taken preceding the exercise period, at six weeks, at termination and one year later. Isotonic strength measurements were recorded weekly during the twelve-week exercise period and one year after termination. Photographs were taken at the end of the exercise period to illustrate the objective increase in triceps bulk.

*Methods of Exercise*—Two methods of exercise in two positions were used. The weight that each subject could lift through the full range of elbow exten-

Read at the Thirty-first Annual Session of the American Congress of Physical Medicine and Rehabilitation, Chicago, September 4, 1953.

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sion ten consecutive times but not eleven consecutive times (ten-resistance-maximum or 10 RM<sup>2</sup>) was determined. This weight was then divided into four parts, that is, one-fourth, one-half, three-fourths and the total weight. Six subjects lifted one-fourth of the weight ten times, then one-half of the weight ten times and so on until all four weights had been lifted ten times, or forty repetitions per exercise period. The remaining six subjects started by lifting the whole weight ten times and progressing in the reverse manner. These exercises were done once daily five days a week. The sixth day a new 10 RM was determined and the seventh was a day of rest. The former method was considered a modification of the technic of DeLorme and Watkins<sup>3</sup> and the latter a modified Oxford technic<sup>4</sup>. Six subjects, three from each of the foregoing groups, performed the exercises in the prone-lying position with the arm resting on the table at 90 degrees abduction and the forearm hanging over the table edge. The exercise consisted of lifting the weight to full elbow extension, through 90 degrees, relaxing, resting momentarily and lifting again, avoiding any assistance in the lift by momentum. The remaining six subjects lifted weight from the supine position, holding the weight over the shoulder and then extending the elbow to 180 degrees with each lift.

*Circumferential Measurements* — Measurements of the greatest circumference of the right arm of each subject, which resulted in a point averaging 17.25 cm. above the olecranon process, and the circumference 2 cm. below this point, were carried out with a 0.25-cm. steel tape, first applied with no compression of skin and second tightly drawn. All measurements were taken in position 1 (fig. 1). The 2-cm. metallic cuff on the graduated rod enabled one to duplicate the level quite accurately, using the upper and lower edges as points of reference.

*Strength Measurements*: Isometric Strength—Measurements were taken by having the subject pull with full force against a resistance wire strain gauge



Fig. 1 — Position 1 of subjects.

while seated in a specially constructed chair with the trunk stabilized at hips and thorax. The force exerted by the right triceps was recorded with the extremity in two positions. In position 1 (fig. 1), the shoulder was at 0 degrees flexion and rotation and approximately 15 degrees abduction. The forearm was at a 120 degree angle with the arm, a position in which others have recorded the greatest triceps power<sup>5</sup>, and the forearm was held halfway between supination and pronation on the armboard. The elbow was strapped to the stationary



Fig. 2 — Position 2 of subjects.

upright behind the arm to use as a fulcrum. The subject was then instructed to steady himself with the other arm, lower extremities and trunk and exert maximal force to extend the elbow by pressing down on the free end of the armboard at right angles with the strain gauge. In position 2 (fig. 2) the shoulder was flexed 90 degrees, abducted 45 degrees and at 90 degrees external rotation, with the elbow and forearm in the same relationship as in position 1 but not attached to the armboard. As before, the subject was instructed to attempt to straighten the elbow, but in this instance the force was applied against a wrist strap attached at right angles to the strain gauge. The force exerted in both positions altered the electric resistance of the strain gauge and was registered using a galvanometer on a scale calibrated in pounds. The recording apparatus was constructed by the Section of Engineering of the Mayo Clinic into the small compact unit shown in figures 1 and 2.

*Isotonic Strength*—The weekly 10 RM values were recorded as the isotonic strength measurements.

#### Results

*Circumferential Measurements*—All the circumferential measurements were done by the same examiner. In spite of great care in duplicate measuring, small differences were consistently recorded. During single duplicate measurements on twenty subjects at the same level on the right arm with the tape loosely applied, there was a mean difference, trial 1 minus trial 2, of  $0.06 \pm 0.05$  cm. In twenty duplicate measurements with the tape drawn to an optional tension that compressed the subcutaneous tissue, the mean difference was  $0.08 \pm 0.07$  cm. Neither of these differences was statistically significant ( $P > 0.2$ ). Since the level of measurement was quite accurately duplicated and the elbow was at the same angle, these differences in duplicate measurements were probably due to difficulty in reproducing identical tension of the tape. Since single measurements differed so little by this method, they were considered reliable.

Table I — Mean Circumferential Measurement of Right Arms of 11 Subjects Before and After Twelve-Weeks Progressive Resistance Exercise and One Year Later

	Circumference, cm.		Difference Per cent
	Initial	Final	
Tape loosely applied			
Upper limit*	30.00	30.91	$0.91 \pm 0.2$ † 3.0
Lower limit‡	29.45	30.70	$1.25 \pm 0.17$ 4.2
Tape tightly applied			
Upper limit*	27.50	28.10	$0.60 \pm 0.25$ 2.2
Lower limit‡	27.30	28.07	$0.77 \pm 0.18$ 2.8
Mean gain at termination of exercises			$0.88 \pm 0.08$ 3.1
Mean gain one year later			$0.55 \pm 0.29$ 1.9

\*Average of 17.25 cm. above olecranon process.

†The numbers after the  $\pm$  signs are the standard errors of the differences.

‡Average of 15.25 cm. above olecranon process.

The measurements of right arm circumference of eleven subjects recorded before the exercise period began and at termination, at both levels and by both technics, are illustrated in table 1. The mean increase ranged from  $1.25 \pm 0.17$  cm. (4.2 per cent) at the lower point with the tape loosely applied to  $0.60 \pm 0.25$  cm. (2.2 per cent) at the upper limit with the tape tightly applied. The mean gain in circumference by all measurements was  $0.88 \pm 0.08$  cm. (3.1 per cent). These are statistically significant differences but are smaller than one would expect from the appearance of the arms (fig. 3). Measurements at



Fig. 3 — A subject at the termination of the period of exercises.

the end of one year after the exercise period showed that a mean gain of 1.9 per cent was retained, but there was a 56 per cent loss of the mean gain recorded at termination of the twelve-week exercise period.

There was a mean weight loss by the eleven subjects of 2.36 pounds or 1.7 per cent during the exercise period and a further loss of 0.36 pound at the end of one year. During the three-month period of exercises, one subject went on a voluntary weight reduction diet and lost 14.5 pounds resulting in a 0.7 cm. reduction of arm circumference in spite of the exercises. For this reason his measurements were not included in the calculations of circumference gain.

**Strength Measurements:** Isometric Measurements — In both positions of testing, the isometric strength of the triceps was recorded by allowing the subject to exert full force for approximately five seconds to avoid the effect of sudden effort. Darcus<sup>8</sup> pointed out that the major effect of isometric force is produced during the first two or three seconds of effort. In duplicate tests, approximately thirty minutes apart, with identical subject position, there was no increase of force over the original measurements using both positions. However, in position 2 there was a tendency to modify the position while exerting full force. The subject tended to retract the shoulder to obtain a more obtuse elbow angle and thus exert more shoulder girdle power. A bar was placed behind the shoulder; then with additional supervision an attempt was made to reduce this factor to a minimum. Since the recorded effect of the first effort was consistently greater than that of subsequent efforts, this measurement was used as the isometric strength value.

The mean gain in isometric strength at termination of the exercises as measured by position 1 (fig. 1) was 6.2 pounds (14.4 per cent). In position 2 (fig. 2) the mean gain was 44.1 pounds (69.6 per cent). The wide difference in measured gain of isometric strength by these two methods cannot be completely accounted for but they are both

statistically significant gains.

**Iso tonic Measurements** — The results of the exercises done in the two positions described under "Methods" are illustrated in figure 4. The subjects were

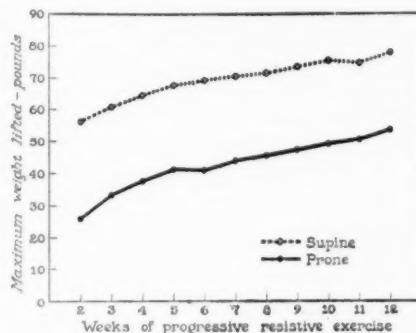


Fig. 4 — Weekly 10 RM measurements of extension of right elbow in two positions during progressive resistance exercises; average of six subjects each.

not able to lift as great a load in the prone position as in the supine position but there was a greater increase in 10 RM. There was a 27.2 pound (100.4 per cent) increase in 10 RM by the subjects using the prone position and a 21.5 pound (38.2 per cent) increase in the subjects using the supine position.

The progression of the mean 10 RM obtained in two groups of six subjects performing each of the two modified methods of exercise is illustrated in figure 5. As one would expect, the 10

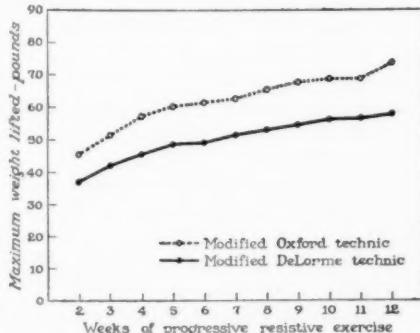


Fig. 5 — Weekly 10 RM measurements of extension of right elbow by two methods of progressive resistance exercise; average of six subjects each.

RM values were greater in the progressively decreasing muscle load method (modified Oxford technic) throughout the exercise period. This method produced a greater increase in the 10 RM by 7.3 pounds (5.5 per cent) than the progressively increasing muscle load method (modified DeLorme technic).

The values of the 10 RM as determined weekly over a twelve-week period for each subject were averaged for the twelve subjects and graphed as shown

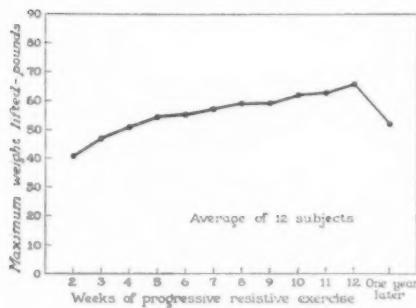


Fig. 6. — Weekly 10 RM measurements of extension of right elbow during twelve weeks of progressive resistance exercise and one year later; average of twelve subjects.

in figure 6. This illustrates a mean gain in isotonic strength over the period of exercise starting at 41.25 pounds and ending at 65.75 pounds, a difference of  $24.5 \pm 2.74$  pounds, a gain of 59.4 per cent. As indicated by the decrease of 10 RM on this graph there was a loss of strength of the exercised muscles after one year. This decrease of the mean 10 RM of 13.6 pounds represents a 55 per cent loss of the 24.5 pounds gained at the end of the exercise period but is still 26.5 per cent greater than the initial 10 RM value.

When the results of all measurements were averaged and the mean gain in circumference of the right arm was compared with the mean gain in strength of elbow extension for each of the twelve subjects at the end of the exercise period, there was no significant correlation (correlation coefficient = 0.17). However, these two factors seemed related in half of the subjects.

### Comment

The 55.2 per cent difference in mean gain in isometric strength as measured by the two methods cannot be adequately explained. In position 1 (fig. 1) the elbow was strapped down with a web strap and padded with felt. No subject complained of pain under the fulcrum on maximal exertion. The position of the subject was quite consistently held during the application of force. However, there is a possibility that the subject leaned slightly to the left, thus pulling upward against the fulcrum and decreasing the downward pressure on the arm-board during the short-duration static contraction. If this occurred, the investigators were not aware of it and it would probably be a highly variable factor.

In position 2 (fig. 2) the long head of the triceps probably produces a much greater force because it is stretched to a greater length. It is possible that the long head was particularly strengthened by the exercises, thus showing a greater gain. Position 2 was more difficult to stabilize than position 1 because of the tendency to apply shoulder girdle power. With training this probably became a greater factor in later measurements and was effective in increasing the recorded gains. The latter factor probably had the greatest influence on the difference between the two tests because in this position there was a greater range of individual percentage gains.

Isometric testing of muscle strength is difficult because of the necessity for stabilization of the moving part and apparatus<sup>8</sup>; this is particularly true of a muscle that enters into movement of the highly mobile shoulder joint. Darcus has recently described a new method of measuring isometric muscle strength and reports a range of 16 to 27 per cent increase in strength in extension of the knee and 36 to 42 per cent in elbow flexion. The period of training was not stated.

Our methods of isometric testing admittedly leave much to be desired. Preliminary tests indicate that the best way to test the isometric strength of the

triceps brachii is in the supine position with the shoulder flexed at 90 degrees and stabilized mechanically.

The 5.5 per cent additional gain of isotonic strength produced by the modified Oxford technic of progressive resistance exercises over the modified DeLorme technic is small compared to the over-all gain of approximately 60 per cent. A larger series of experiments is necessary before it can be concluded that these methods produce consistently different results.

The 62.2 per cent difference in gain of strength between the two positions of exercise is considered of some importance. This probably is due to the isolation of the triceps in the exercises done in the prone position producing an excellent exercise effect. In the supine position one can hardly avoid the effect of thrust, using momentum produced by shoulder girdle muscles to assist the triceps brachii in extending the elbow thus reducing the exercise effect on the triceps.

The loss of 55 per cent of the strength gained by the exercises one year after their termination does not support earlier reports. Gallagher and DeLorme<sup>6</sup> reported no loss of ability to lift weight by 1 RM measurements in knee extension in seventeen adolescent boys, during convalescence from knee injuries, over a two-month to twelve-month period. Our series was with young, active, normal adults and all were checked at twelve months by 10 RM measurements. The significance of age and activity of the subjects, of the difference in periods of follow-up and of the method of measurement is not known.

No study was applied to the contralateral effect of exercises but the 10 RM measurement of left elbow extension at conclusion of the right triceps exercises was found to be 17 per cent greater than right elbow extension before the exercises were started. This observation seems to indicate indirectly that there possibly was an increase in strength of the unexercised triceps brachii.

The commonest clinical measurement

of muscular hypertrophy and atrophy is the circumference of an extremity, thus including the muscle to be evaluated. With this method, one encounters many variable factors. Among others the amount of subcutaneous tissue, the state of hydration, the amount of vasodilation, the state of development of other included muscles and the muscle length are modifying factors. This must be kept in mind when one is attempting to evaluate the size of a single muscle in an extremity by circumferential measurements.

The retention of 44 per cent of the mean increase in arm circumference after one year associated with 1.7 per cent mean loss of weight in a group of active physical therapists indicates that a portion of hypertrophy is probably retained for a considerable period of time.

The loss of arm circumference by the subject on the reducing diet could possibly be due to extreme loss of subcutaneous fat. Loss of weight probably has a highly variable effect on arm circumference but the 1.7 per cent loss of weight of the eleven subjects in this study was considered insignificant.

The lack of correlation between the degree of measured increase in arm circumference and gain in strength of elbow extension does not mean that there was no corresponding hypertrophy of the triceps muscle in single subjects. As discussed previously, too many factors are involved in this gross measurement and the series was small.

#### Summary

In an effort to produce hypertrophy of the triceps brachii muscle twelve subjects were submitted to twelve weeks of progressive resistance exercise, measured and followed for one year. Two methods and two positions of exercise were studied. Two methods of measuring arm circumference were analyzed. Isotonic and isometric measurements of strength were carried out and two methods of isometric measurements were tested. This study has resulted in certain findings:

Significant gains in arm circumference

and strength of elbow extension were produced by daily progressive resistance exercise over a twelve-week period.

The prone-lying position in exercising the triceps brachii produced greater gains in strength than the supine-lying position.

There is little difference in results from the two modified methods of exercise as used in this experiment.

Single circumferential measurements with a  $\frac{1}{4}$ -inch steel tape either tightly or loosely applied were considered reliable when the same observer did all the measuring by carefully duplicating the tension on the tape.

Isometric strength measurements are difficult to carry out. The methods used in this study were unsatisfactory.

Of the increase in mean isotonic strength of elbow extension and right arm circumference at the end of the twelve-week exercise period there was a 55 per cent and 56 per cent loss respectively one year later.

There is no correlation between the percentage gain in right arm circumference and strength of elbow extension as recorded from the subjects in this study.

### Discussion

**Dr. Ray Piaskoski (Wood, Wis.):** Since DeLorme's original report, the production of muscle hypertrophy by means of progressive resistance exercises has taken its place as one of the most useful and frequently prescribed therapeutic procedures in physical medicine. Originally, its application was largely on an empirical basis.

If a therapeutic procedure is to be developed to its highest degree of usefulness, we must learn everything possible about its physiological basis. That is why studies of the kind reported by Doctors McMorris and Elkins are so important and I wish to commend them for work well done. There are two points in their report upon which I would like to comment briefly. They conclude that

circumferential measurements are reliable only if the same observer can adequately duplicate the tension on the tape and that methods of isometric strength measurement are unsatisfactory. It would follow that more accurate methods of measurement are urgently needed and I should like to ask what is being done to solve this problem?

The second point relates to the 55 and 56 per cent loss of isotonic strength and arm circumference at the end of one year. Clinically, this means that our patients must continue some degree of exercise if they are to maintain the hypertrophy produced in the active treatment period. DeLorme and Watkins make note of this fact in their book. They state that strength, once developed, subsides at a much slower rate than it develops and that in some of Gallagher's adolescent subjects there was no reduction of strength a year after exercise was stopped. Others showed only small decreases, but that even these smaller losses could be prevented by one to three workouts per week.

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# Present Status in the Management of Spasticity and Spasm: Preliminary Report

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This preliminary paper is a joint study by the Physical Medicine and Rehabilitation and the Neurological Services, which includes our experience at the Veterans Administration Hospital, Hines, Ill., over approximately the past seven years, with hundreds of patients having muscle spasticity and spasm resulting from upper motor neuron lesions. We have not attempted to review and evaluate the entire and extensive literature on this subject. A more intensive study and detailed report is in progress.

For the purpose of this presentation, we have considered spasticity, as it is seen in upper motor neuron lesions, described by Pollock and associates<sup>1</sup> as being characterized by an increase over normal of the tension of a muscle, resulting in continuous increase of resistance to stretching. This increase of resistance is usually felt from the beginning of the stretching activity and it may increase in proportion to the extent and the speed at which the muscle is lengthened.

Spasm is most often used loosely to denote involuntary movements of the extremities. This includes the so-called pseudospontaneous spasms and reflex spasms, although all are reflex with known or unknown sources of stimulation. Pseudospontaneous spasms are usually bilateral and symmetrical, and the stimuli are of unknown origin but are considered to be midline and often visceral, such as a distended bladder or rectum. These spasms may also, however, be evoked by unknown external stimuli such as movement of indwelling catheters, or presence of decubitus ulcers. Reflex spasms include those involuntary movements which follow known stimuli (usually of the extremities) and are most commonly unilateral but may be

followed by contralateral movements. In an evaluation of 589 patients at this hospital, Pollock and associates<sup>2</sup> found that the incidence of spasms varied in relation to the segments affected, but that 60 to 70 per cent of all patients with spinal cord injuries experience this complication to some degree.

While spasticity and spasms are annoying phenomena to the patient, they are an important influencing factor on the rate and amount of rehabilitation that is possible. Up to the present time, numerous drugs, a variety of surgical technics and many physical medicine and rehabilitation procedures including utilization of postural reflexes and neuromuscular reeducation, have been utilized in the treatment of this problem. We are aware of the use by others of ultrasonic radiation, twenty per cent carbon dioxide inhalations, alcohol injection, ion transfer of various drugs and even total excision of the segment of the spinal cord distal to the lesion. Yet the satisfactory solution of the management of spasticity and spasm appears to be quite distant.

In most cases in our experience, the prevention or elimination of all infection with antibiotics, other drugs and procedures, the removal of bladder and renal calculi, the prevention and relief of bladder and bowel distention, the

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This study was made by the Physical Medicine and Rehabilitation Service and the Neurological Service, VA Hospital, Hines, Ill.

healing of decubitus ulcers, the institution of physical medicine and rehabilitation activities and the element of time, all have had a favorable influence in decreasing the muscle spasticity and the frequency and intensity of the spasms.

It is important to have a reliable and objective means of evaluating the intensity of spasticity, both before and after instituting any type of treatment. Electrodiagnostic procedures, including electromyography, have also been used in an attempt to evaluate objectively the degrees of spasticity. In this paper, an apparatus is described which was utilized by Pollock and Davis<sup>6</sup>. It also was employed in our study, and one which we feel has value toward accomplishing this goal.

It must be stressed that the evaluation of any therapeutic measure is extremely difficult because of the additional effects of emotional and environmental factors and, further, that spasticity and spasm in itself may vary from minute to minute, a fact frequently noticed even during a single examination.

The resistance to stretching a spastic muscle usually varies with the speed of stretching. The faster the rate of stretch, the greater the resistance. For a more reliable and valuable study, patients should be observed and examined almost constantly.

#### Evaluation of Drug Therapy

On the paraplegia wards various drugs have been used in an attempt to decrease the painful spasm and the spasticity. Among those used have been bromides, barbiturates, hyoscine, atropine, curare, myanesin and narcotics. The narcotics, such as codeine, morphine, and Demerol (Meperidine) hydrochloride should be used rarely and only when the spasms are so painfully severe that the patient is unable to rest. In patients who have been admitted from other hospitals, we have had a number of narcotic addicts, who presented additional problems.

In our experience, bromides were used on many patients, the dosage being controlled by blood bromide deter-

minations. At times the drug was given to the point of toxicity and yet there was no appreciable amelioration of spasm or spasticity.

When Mephenesin (marketed as Dioloxol, Myanesin, Myoxane, Oranixon, Sinan, Tolserol and Tolulexin) was first described as a curare-like drug, Finkelman and Arieg<sup>7</sup> used it experimentally on animals and then on patients. It was tried in the rigidity of Parkinsonism; for the spasticity and intention tremors of multiple sclerosis; and for the spasticity of myopathies. The therapeutic effectiveness of this drug, as compared to hyoscine hydrobromide, was studied in a patient with severe rigidity in Parkinsonism who was fairly well controlled with the use of the latter drug only. Myanesin was given intravenously in therapeutic doses in addition to one one-hundredth grain doses of hyoscine six times daily. The patient became weaker, but was still able to walk. For further control, the patient was hospitalized and the hyoscine was withdrawn completely for three days. His rigidity became so severe that he was unable to speak, eat, or move any of his voluntary muscles. He developed urinary and bowel retention. At this time, he was given intravenous injections of 400 Mg. of myanesin and it was found that there was no decrease in his rigidity. The patient was then placed on hyoscine at which time he again became ambulatory.

In another patient with post-traumatic myopathy with severe spasticity and paraplegia, intravenous administration of 400 Mg. of myanesin had no effect. A patient with chronic encephalitis with marked tremor had a transient decrease of the tremor and felt more relaxed when given myanesin intravenously. However, the effect was very transient, lasting from five to ten minutes. In another patient with chronic encephalitis with marked rigidity and mild tremor, intravenous myanesin caused a reduction of the rigidity for only a few minutes with no objective lessening of the tremor. In a patient with amyotrophic lateral sclerosis com-

plicated by flexion contractures of the lower extremities, myanesin administered intravenously caused increased weakness of the paretic limbs. In a patient with severe multiple sclerosis, marked intention tremor and spastic paralysis of the lower extremities, intravenous myanesin caused a ten minute decrease of the tremor of the hands; however, the paralysis of the lower extremities increased. These experiments were repeated, with the medications being given orally with doses up to four gm. daily. No objective therapeutic effects were noted with these doses. Where there was some decrease in spasticity, frequently the subsequent weakness overshadowed the relaxing effect. We feel that the intravenously administered myanesin has a very transient relaxing effect, which is probably due to its action on the higher nerve centers. We were also unable to demonstrate any appreciable definite therapeutic effect from the drug when it was administered orally.

There are many papers attributing good results to the use of curare. Boshes and Blustein<sup>6</sup> used short and prolonged acting curare in their work at Hines VA Hospital on eight patients with severe spastic paraparesis. They found after extensive muscle testing and measuring of joint range of motion, that none of the patients had relief from spasm. In four patients the spasms were apparently increased by the use of the drug. It was found that central toxic effects such as blurred vision, diplopia, nausea, vomiting, involuntary bowel movements, syncope and dyspnea occurred before there was significant peripheral muscular relaxation. It was considered not only ineffective but dangerous to use. These results were corroborated by one of us (A.J.A.) in six patients at Cook County Hospital with severe spastic paraparesis. Increasing doses of curare to the point of danger revealed no definite decrease in spasticity or rigidity. In most cases, the respiratory muscles were affected before there was any evidence of significant therapeutic effect on the peripheral spastic muscles. Unless they were fearful, subjectively, the patients usually

improved; in fact, they felt better the third and fourth days after curare which appeared to be dangerous psychotherapy in our opinion.

To date two other drugs, Benztropine MK-O2 (tropine benzohydryl ether methane sulfonate) (Merck) and Prenadol (2, 2-diethyl - 1, 3-propanediol) (Squibb) have been used in a few cases and as yet with no success.

#### Evaluation of Physical Medicine and Rehabilitation Procedures

There are a number of physical medicine and rehabilitation procedures available in the management of spasticity and spasm. We have used several criteria in evaluating the effectiveness of the various therapies: (1) intensity of the spasticity and spasm; (2) frequency of the spasms; (3) range of motion, and, (4) extent of interference with self-care and daily living activities. All of the foregoing criteria were evaluated pre- and post-treatment by the physiatrist and therapist, by direct observation and measurements with the Newman myometer<sup>8</sup>, by goniometry, and also by careful questioning of the patient.

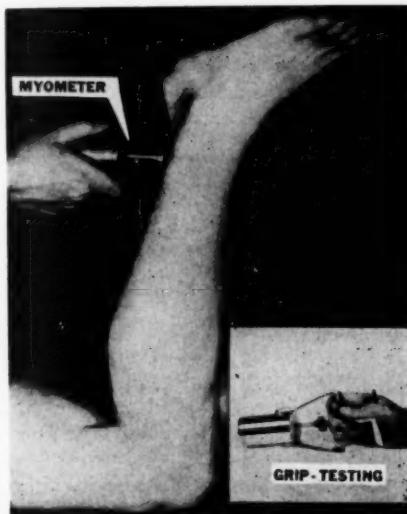


Fig. 1 — Method of testing the force necessary to overcome the spasticity of the flexor muscles of the knee, using the myometer. Inset shows the myometer in the holder for grip-testing.

When evaluating with the myometer, the force in pounds necessary to overcome the muscle spasticity, is measured both pre- and post-treatment. In testing, it is essential that the force through the myometer always be applied smoothly, at the same point, and in the same direction as in all previous tests to obtain like results. It is also desirable to mark the point of application on the skin. A maximum reading reset pointer indicates the maximum force exerted at any time. The myometer grip-tester is used to evaluate the patient's grip. Figure 1 shows the use of the myometer for testing the spasticity of the flexor muscles of the knee as well as for grip-testing.

Heat applied in various ways (such as hydrotherapy, either in the Hubbard tank or therapeutic pool; warm compresses; diathermy or radiant heat) has been used. In our experience, hydrotherapy in conjunction with active and passive exercise of the affected parts was found to be the most efficacious form of heat therapy. Patients were carefully studied over an extended period for subjective findings. Approximately half of these patients experienced some relief from their spasm and spasticity for periods of thirty minutes up to twelve hours. A few stated that the spasms were more frequent and intense when they recurred. The remainder of these patients had no relief, in fact, some stated they felt worse.

Stretching of the spastic muscles was accomplished either by table treatment or standing. Table treatment consisted either of stretching of the spastic muscles by the therapist or through the use of suspension slings utilizing gravity as the stretching force. Figure 2 shows the spastic lower extremities in well-padded splints suspended by long adjustable slings. Both the hip and knee flexor muscles are being stretched. By changing the angle of the sling, the muscle stretching force is varied. The latter method has the advantage of a small force being applied over a long period with minimum trauma and allows the patient to be entirely comfort-

able throughout the treatment, which is for approximately one hour once or twice daily or more often. During this time, heat is applied to the involved muscles. The padded strap across the knees holds the legs in position on patients having violent spasms. Standing was accomplished by placing the patient in parallel bars either in braces or with the aid of padded canvas straps or by the use of a tilt table. Strapped in the standing position the patient can, unaided, stretch the muscles of the abdomen, back, hips and thighs.

Approximately two-thirds of the patients who received stretching showed some degree of relief for variable periods from thirty minutes to seven hours. Several patients who experienced relief felt that the spasms were more frequent and intense when they recurred. Of those who had no relief, a few felt that the spasms were worse during and after treatment.

Intensive active exercises of the uninvolved extremities in some instances were found to give partial relief of spasms and spasticity for short periods. Adequate bracing to immobilize the extremity also aids in diminishing the amount of spasticity and the intensity and frequency of the spasms, probably by reducing the proprioceptive stimuli reaching the spinal cord.

Various electrical therapy techniques were used with some patients for the treatment of this serious complication of upper motor neuron lesions. Combined alternating (AC) and direct (DC) currents, as described by Lee<sup>7</sup>, employing the Teca low-volt generator, were used. The Teca machine produces both types of current simultaneously. Figure 3 shows the negative DC electrode placed in firm contact with the dorsal surface of the foot of the involved extremity (the plantar surface can also be used); and the positive DC electrode placed over the lumbo-sacral area. The AC electrodes were placed over the spastic muscle group. The DC voltage was gradually increased and maintained at 25 volts, although at times it was necessary to increase to 35 or 40 volts. The

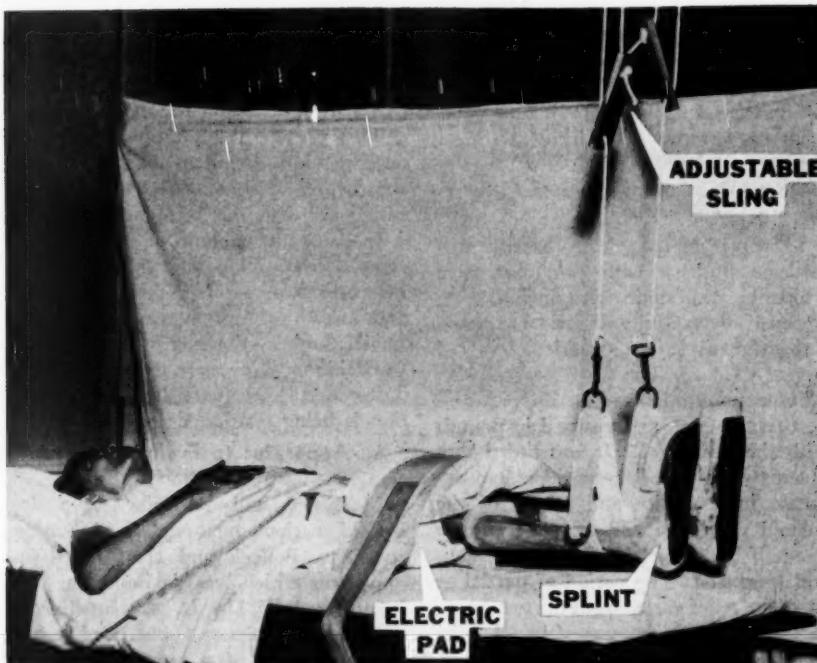


Fig. 2—Stretching the spastic extremities by suspension in splints supported by adjustable slings.

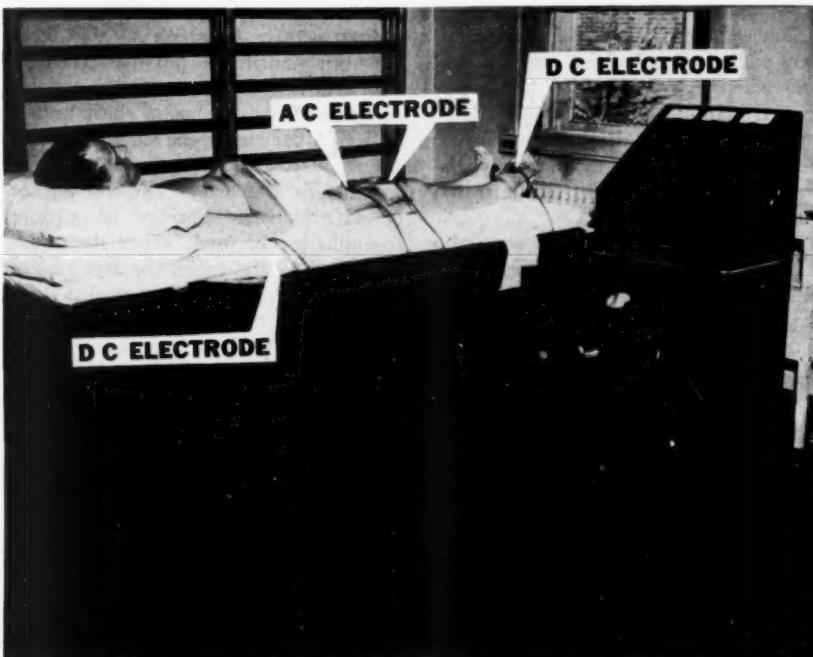


Fig. 3 — Method of obtaining a tetanic contraction of the spastic extensor muscle of the knee using combined alternating (AC) and direct (DC) currents. A bifurcated cord leads to the two positive DC electrodes placed over the lumbosacral area. For photographic clarity, the elastic bandages for holding the electrodes to the extremity were omitted.

DC milliamperes were recorded. The AC at frequencies of 60 to 100 cycles per second was then gradually increased to secure a firm tetanic contraction of the muscle group. Both the voltage and milliamperes were recorded. This procedure was maintained for twenty minutes. Care must be taken to avoid burns.

This method of electrotherapy was used on patients with cerebrovascular accidents, traumatic encephalopathies, however, the majority of patients studied had traumatic lesions at various levels of the spinal cord. The force necessary to overcome the muscle spasticity, pre- and post-treatment, was measured in pounds with the myometer<sup>6</sup>. It was noted that about two-thirds of the patients had decrease in spasticity and spasm of the treated extremity and of these, nearly one-half had some decrease on the contralateral side. The period of partial or complete relief varied from thirty minutes to twenty-four hours, although the greater number was under five hours. The factors responsible for this relief are being investigated.

Some of the patients had varying degrees of limitation in joint range of motion when measured with the goniometer. Interestingly enough, after treatment, the majority had an increase in range of motion of not only the treated extremity but also the untreated one as well.

The results of this therapy were also evaluated by careful daily questioning of the patients. Many of the patients stated that with the relief of their spasms, they were able to perform their self-care and daily living activities such as dressing and undressing, standing and walking, putting on and removing braces better than before, and experience greater comfort while lying in bed. It is significant to note that in those patients having spasticity resulting from cerebral lesions none showed any appreciable functional improvement from treatment with the combined alternating and direct currents.

When the technic was repeated using only the alternating current to produce

a tetanic contraction of the muscle group that was most involved, about the same clinical results were obtained as when the combined alternating and direct currents were used. However, usually a greater amount of current was necessary in order to maintain a tetanic contraction when only AC was used as compared with the combined currents.

In using the technic of producing a tetanic contraction of the antagonist muscle group, as described by Levine and associates<sup>7</sup>, our experiences with a small number of patients were not as favorable as those reported in the findings of Levine, et al. Further investigation is being continued by the authors.

#### An Apparatus to Evaluate Degree of Spasticity

McKinley and Berkowitz<sup>8</sup> have described various methods of evaluating spasticity. Pollock and Davis<sup>9</sup> used an apparatus which was devised after one constructed by Dr. L. C. Hutchinson. This machine, figure 4, also used in our study, consists of a motor so linked through a gear train, that it will produce a reciprocating movement of a sliding member to which a cable leading from a horizontal pulley is attached. The arm support rotates freely and independently on the same shaft as the pulley. A flat spring, the length of which can be varied by an adjustable sliding member, is attached to the top surface of the pulley. Springs of various strengths can be used. When the pulley is rotated by the cable, the free end of the spring impinges on a stop on the underside of the arm support, thereby moving it. The force necessary to move the arm support at any moment, therefore, is determined by the deflection of the flat spring which is transmitted to the writing pen by several small pulleys to secure a tracing on the stationary drum.

The shaft for producing the reciprocating motion can be operated at speeds varying from four to sixty revolutions per minute and enables the extremity to be extended thereby stretching the muscle through a constant range of movement and also at uniform fre-

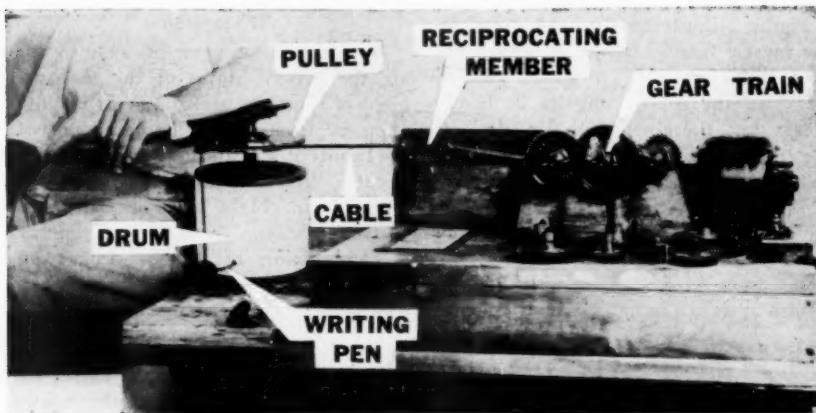


Fig. 4 — The muscle tension curve of the spastic flexor muscles of the elbow being traced on the stationary drum.

quency and force. This muscle tension curve is an indication of the internal resistance of the muscle due to changes in its viscosity and elasticity. The movement of the extremity makes up the horizontal component of the curve, while the tension influences the vertical portion. In spasticity, the internal resistance of the muscle is increased because of changes in viscosity and elasticity. The rationale for the use of this

machine is based on the conception that a tension curve of the force necessary to move a rigid body rapidly about a fixed axis would show a "dip" as a result of the development of velocity, whereas if it were opposed by a so-called viscous substance, such a "dip" would be absent or markedly reduced depending on the substance. An improved machine to evaluate any of the four extremities is being designed.

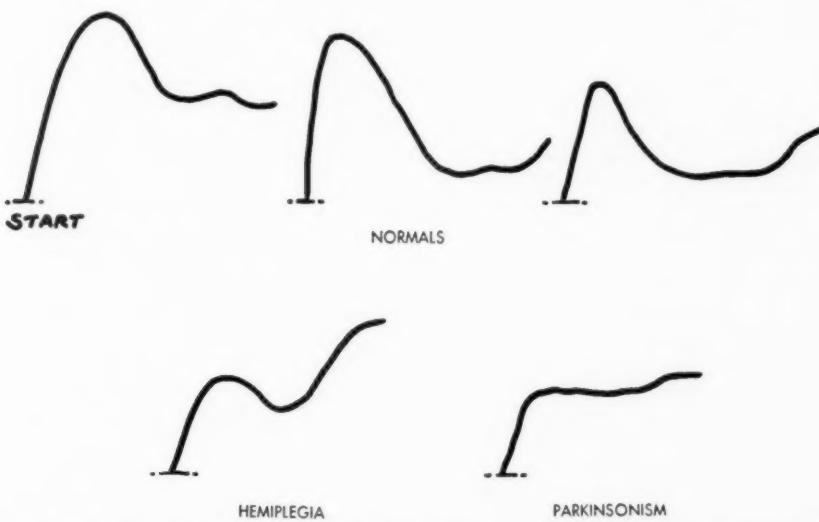


Fig. 5 — Muscle tension curves of normal elbow flexors, of the spastic muscles in hemiplegia, and of the muscular rigidity in Parkinsonism.

Figure 5 illustrates the large "dip" in the muscle tension curves of normal elbow flexor muscles, a much smaller "dip" in the spastic muscles in hemiplegia, and the absence of the "dip" in the rigid muscles in Parkinsonism. A follow-up of one patient was made by A.J.A. over a period of several years in an attempt to evaluate the effect of various medications on the muscle tension curves in a patient with Parkinsonism as shown in figure 6. Curve number-

### Discussion

An attempt has been made to evaluate the present status of the management of spasticity and spasm. It is quite apparent from this preliminary study of the results of short term therapeutic procedures, that a reasonable number of patients can obtain relief of their spasticity and spasms by the use of one or a combination of various drugs and physical medicine and rehabilitation procedures. Furthermore, careful study

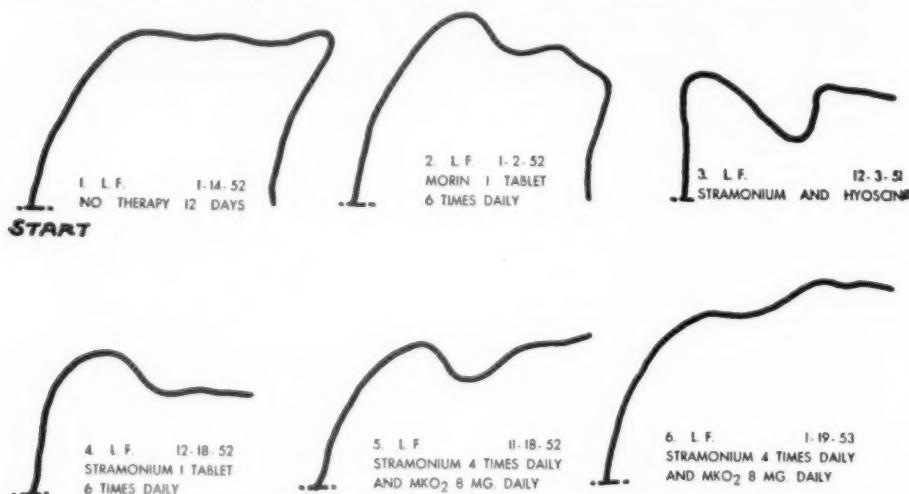


Fig. 6 — The effects of various drugs over a period of several years on the muscle tension curves of the left elbow flexors in a patient with Parkinsonism.

ber 1 is with no therapy. It was found that Morin, an experimental drug, curve number 2, had only a slight effect. Stramonium and Hyoscine, curve number 3, showed the greatest "dip" in the curve indicating that it was most effective in reducing the internal resistance of the rigid muscle to stretching. Stramonium had a fair effect on curve number 4. Stramonium and Benztrpin (MK-O<sub>2</sub>), also an experimental drug, gave a somewhat better effect as seen in curve number 5, although after it was used for some months the effect disappeared, as indicated in curve number 6. This was probably due to either progression of the illness or to increased tolerance to the drug or both. This type of controlled studies with patients having spasticity is being continued.

over the past seven years by Pollock and Associates<sup>2</sup> has shown that seventy-one per cent of all the cases which were closely followed showed a significant decrease in the severity of their spasms with conservative treatment. It was found that in most cases the frequency and severity of the spasms reaches a peak, which is maintained for a variable period of time and then gradually diminishes.

During the early post World War II period of caring for these patients, the severity of the spasms was so great that a considerable number of men were tied to the bed or the chair. At the present time, it is rare to see a patient whose spasms are so severe that this procedure is necessary.

Among 589 post World War II pa-

tients who were studied, 18 rhizotomies were performed at Hines VA Hospital. Most of this surgery was performed in the immediate post-war years. From the recent Korean conflict, 100 veterans studied by Boshes and associates<sup>10</sup> had no surgical procedures performed for spasm or spasticity at this (Hines) hospital. One patient had a rhizotomy and two patients had obturator nerve sections performed before admission to the hospital.

This gradual diminution in the muscle spasticity and the frequency and intensity of the spasms in many cases is due to the prevention or the elimination of infection with antibiotics and other drugs; the removal of bladder and renal complications; the prevention and relief of bladder and bowel distention; the healing of decubitus ulcers, physical medicine and rehabilitation procedures and the element of time. The problem is an extremely complex one, for not only is the spastic extremity affected, but the entire bodily functions are influenced as well.

#### Summary

The scope of this difficult problem of spasticity and spasm associated with upper motor neuron lesions and its effect on rehabilitation procedures, is far-reaching. For example, 60 to 70% of 589 World War II patients and 72% of 100 patients injured since the onset of the Korean conflict, with spinal cord lesions, experienced spasticity and/or spasm to some degree. The incidence is greater in the upper levels and diminishes as the level of the lesion lowers.

Various drugs used in an attempt to relieve spasticity and spasm associated with lesions of the brain and spinal cord have been evaluated and discussed and it is felt that to date there is no truly functionally effective drug therapy.

Neurosurgery should be done only when specifically indicated. However, the necessity for surgical procedures has diminished as our experience with this condition has increased.

Physical Medicine and Rehabilitation techniques (that resulted in some improve-

ment in approximately half of the patients) have been described and evaluated. However, with the elimination of all infection, the removal of bladder and renal calculi, the prevention and relief of bladder and bowel distention, the healing of decubitus ulcers, the institution of physical medicine and rehabilitation activities and the element of time have favorably influenced spasticity and spasm so that the patient's functional ability was increased.

An apparatus has been described and used which has promise of giving more reliable means of evaluating spasticity and spasm and its response to therapy. An improved machine is being designed.

A true evaluation of any procedure for its effect on spasticity and spasm is extremely difficult inasmuch as controlled studies are influenced by many factors such as environment, and in the incomplete spinal cord lesions by subjective feelings of the patient. Evaluation is further less reliable, as spasticity and spasm may vary from minute to minute, and frequently during a single examination.

In those patients with spasticity and spasms of a degree that interferes with proper rehabilitation, all procedures should be tried either singly or in combination. Physical medicine and rehabilitation procedures should be instituted early and for a sufficient period of time.

Our experience with spasticity and spasm has increased. However, research, both basic and clinical, must be continued in order to solve or alleviate this annoying, difficult, and at times frustrating condition, to both patient and physician.

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### Discussion

Dr. Joshua Ehrlich (Albany, N.Y.): Even though this is a preliminary report, the authors are to be congratulated on the excellent presentation of such an important subject. Much emphasis has been placed on the time element with reference to the temporary improvement of treatment given to patients. It is agreed that all possible types of palliative therapy consisting of all known modalities of treatment used in Physical Medicine and Rehabilitation should be employed for a sufficient period of time

before recourse to surgery, if the latter is indicated.

As physiatrists our main purpose should be to enable the patients to become ambulatory and to be able to take care of themselves to the greatest possible degree. It is hoped that within the near future apparatus and instruments will be developed, which will give better quality of treatment and longer lasting results than heretofore. It seems that an approach is being made to the development of more exact methods of treatment and evaluation because of the finer instruments that are coming into use; and also, in the field of chemistry where finer and better drugs are being prepared. Personally tried during the years 1930-1934, was transcerbromedullar or transmedullar iontophoresis with calcium chloride.

This was used in hemiplegia, multiple sclerosis and other myopathies but with very poor results. From experience in recent years, it was found that hydrotherapy with progressive exercises including stretching has been relatively the best form of treatment.

It is hoped that with all the modalities of treatment explained in this paper much better results will be accomplished. A certain degree of improvement in the patients is now evident. The future will probably give them promise of better results and a feeling that with improvement of their spastic condition they will not be relegated to a total wheelchair existence. Further investigations of spasticity and spasm should be encouraged.

Acknowledgement — The authors are indebted to the personnel on the Physical Medicine and Rehabilitation as well as the Neurological Services of Hines VA Hospital, and to Miss Bonnie L. Below, A.R.P.T., for the splendid assistance rendered with this difficult problem. Grateful acknowledgement is also made to the Medical Illustration Laboratory for the excellent photographs.

## Team Approach to Upper Extremity Prosthetic Problems

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It is rather disappointing that man, who has invented electronic brains to do his calculations, and electronic hands to manipulate dangerous chemicals, has not found time to invent equivalent devices to replace lost limbs. Perhaps such an ideal is already taking shape in a mathematician's formula, or in an engineer's blueprint, but the finished product is as yet unborn. However, our purpose is not to gaze into the future, but to consider the best in upper arm prostheses available to us today, crude as they are in comparison with the ideal.

These remarks highlight the fact that advances in this field arise as a cooperative effort in many technologies. Recognizing the shortcomings of artificial arm limbs, about seven years ago the government-sponsored National Research Council with the Advisory Committee on Artificial Limbs, assigned programs of development and research to the Prosthetic Research Division of the University of California at Los Angeles; the Veterans Administration, and the Prosthetic Devices Study at New York University. Physiologists, physicians, engineers, prosthetists and therapists have thus been drawn together in a common effort. As a result, better materials have been elaborated, which are more comfortable and durable. New technics of manufacture have been developed. Mechanical devices are now somewhat more versatile in harnessing residual power to replace the action of the lost limb.

To bring the findings from the laboratory to the field, the National Research Council is now conducting a course at U.C.L.A. for physicians, therapists and prosthetists. This course is predicated on a team approach to the solution of the problems of the arm amputee. It is felt that the combined talents of several

specialists are essential in the successful manufacture and use of such a complicated mechanical tool as an artificial arm, which requires not only careful fit, but subsequent training. Anything less would be analogous to allowing a pharmacist to prescribe drugs as well as to compound the prescription. Consequently, carefully developed standards of construction, prescription and training as applied to an artificial limb are being taught in their "case study" unit.

Why is intensive cooperation necessary? The replacement of a lost arm must be better than merely passable to be accepted by the user. In the case of replacement of a lower limb, where stability is the essential prerequisite, the patient is more easily satisfied because he cannot do with one limb. On the other hand, the upper extremity depends on mobility for function. Moreover, it is estimated that a one-armed person can perform ninety to ninety-five per cent of his necessary activities with his remaining limb. The prosthesis, therefore, must contribute something of positive value by its mobility and ease of operation; otherwise, it will soon be discarded. Often, failures may be due not to the wearer's caprice, but to the lack of utility of the device. Many details arise before adequate replacement can be attained, and no one person can deal with them. To insure the objectives of rehabilitation in an arm amputee, four aspects must be considered: a) the medical evaluation; b) the technical aspects of construction; c) adequate training, and d) the vocational demands. It is obvious, therefore, that a planned attack

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in which the physician, therapist, prosthodontist, and often the vocational counselor play a role, will help to anticipate difficulties and minimize errors in management. It will reduce the wasteful process of providing unused limbs and increase the functional performance of the amputee. How often the patient will be provided with such ideal management depends upon the awareness of the surgeon in the first instance.

#### Medical Evaluation

In the medical examination, there are four important factors to be considered: (1) local condition of the stump; (2) the residual function; (3) the general physical state of the patient, and (4) the drive of the individual to acquire the skill in operating the device.

The presence of pain and tenderness in the stump will obviously demand first attention. These symptoms may be due to a neuroma, a bony spur, or adherent scar tissue. These may require surgical elimination. However, it should be remembered that an experienced prosthodontist may be able to by-pass the difficulty of local pain by accurate relief moulding of the shell of the prosthesis to avoid pressure over a sensitive area. There may be other conditions which need attention before fitting a prosthesis. For example, ulcerations because of vascular insufficiency, or chronic infection of the skin or underlying tissues may require rather prolonged medical treatment before committing a patient to an artificial device. A local dermatitis from allergy to wool may be solved simply by substituting a cotton for a woolen stocking. Furthermore, if edema or flabby tissues are encountered, adequate shrinkage should be taught by therapist or prosthodontist to avoid premature fitting of a custom-built socket.

Besides pathological conditions locally, the stump should be examined for its functional state. Following amputation, disuse may reduce muscle power. Consequently, the efficacy of a good prosthesis may be lost if the muscles activating it are not at peak performance. Similarly, limitation of joint motion may

also militate against optimal function. Muscle and joint activity need to be evaluated and if below normal, a period of restorative exercises should precede the fitting of a prosthesis. At this point, the qualified therapist plays a part. A second component in evaluating function is the amount of remaining limb. This also determines the precise details embodied in the prosthesis. An amputation above the elbow will necessarily have different requirements than one below the elbow, in that the former will need an artificial elbow joint and some provision for its activation. The below elbow prosthesis, however, is mainly concerned, where practical, with preserving as much pronation and supination as possible. This consideration is often overlooked in the prescription.

Principles have been evolved to govern the proper choice of the components that enter into a prosthesis, corresponding to the particular site of amputation (Charts are available from U.C.L.A., Prosthetic Research Division, Los Angeles). However, it is most important to point out that while standards may be useful, a certain amount of elasticity is imperative, because an intimate tool like a prosthesis must be individualized. Thus the patient's desires, as well as the surgeon's skill along a particular line, may also determine the final choice. For example, a cineplasty may be considered to activate the terminal grasping device. For this reason many workers believe that the patient should be exposed to different types of artificial limbs before committing him to a particular one. In other words, not only is the anatomy of the limb important, but also the anatomy of the mind.

In addition to the local situation, a thorough examination should include the underlying causes for the loss of the limb and the general systemic condition of the patient. Where malignancy or impaired circulation is responsible, the physician may wisely choose to make more detailed studies before prescribing a limb.

Another factor of great importance to ultimate success is the personality

makeup of the amputee. The patient is a crucial member of the team. Lack of motivation, poor adjustment, or other emotional difficulties can vitiate an otherwise favorable prognosis. If he does not display a positive interest, the entire effort may be doomed to failure. As an example of lack of drive, a man who had lost an arm many years ago presented himself for prescription of a limb. He was presently employed as an electrical welder and had made excellent adjustment to his situation. When asked why he had presented himself to the clinic he replied, "Oh, somebody sent me a letter asking me to come." "Somebody" wanted him to report, not he, himself. Since he displayed no positive feeling for an artificial arm, the decision was made against outfitting this man. Perhaps, if he had been supplied with a good arm early in his disability, his attitude would have been better and his earning power enhanced. This illustration also emphasizes the point that replacement must be done early. Delay may mean acceptance of the one-arm status, and though adjustment certainly has advantages, it may prevent the patient from realizing his full vocational potential.

#### Technical Aspects of Construction

The limb manufacturer obtains a prescription within the framework of the medical examination. Within these limits the prosthetist's skill and experience are allowed free latitude. It is not the problem here to elaborate on a detailed discussion of the manufacture and components of an upper limb. However, certain points will be emphasized.

First, in regard to a below elbow prosthesis with a very long stump, maximal supination and pronation are assured by constructing a forearm socket, of which the end is invaginated to form a cup to receive the tip of the stump snugly and thus prevent slippage of the forearm against the shell of the prosthesis. The socket need be stabilized to the arm only with a light triceps pad for comfort, and flexible hinges for least

constraint to motion. The terminal device is activated by a simple figure-eight harness placed high on the back. At the Institute for the Crippled and Disabled, the socket is made of layers of fiber glass cloth impregnated with plastic, and moulded on an original impression of the patient's stump. In somewhat shorter stumps, since supination and pronation are ineffectual, the main attention is given to retaining effective elbow flexion by good stability of the forearm cuff. In this instance a bicentric elbow hinge promotes synchronous rotation of the mechanical and anatomical joints. For the very short stump, it may be possible to retain elbow flexion by providing a so-called step-up flexion unit, which multiplies the arc of motion of the prosthetic forearm. To utilize efficiently a device of this sort, the stump must measure about four inches from the end to the medial epicondyle of the humerus. It should be emphasized at this point that along with the prosthetist's ingenuity and knowledge in making a limb, the manner of harnessing and placement of the controls is most significant in attaining a highly efficient prosthesis. This latter point applies to any upper limb device.

In loss of limb above the elbow, the main concern is to retain maximal glenohumeral function and to operate effectively, by shoulder motion, a mechanical elbow and terminal device. To do this a somewhat different harness than the type used for below elbow amputations must be applied to the back to supply power. Further modification of the harness will depend on the heaviness of the work assumed by the patient. It may be pointed out that where possible, it is not necessary to sacrifice the terminal end of the humerus in order to allow room for a mechanical elbow joint, since the prosthetist can insert side elbow-locking hinges. In very short arm stumps and in disarticulation of the humerus, the manufacturer would have to resort to a shoulder prosthesis. Today, this device offers only elbow flexion and grasp; there is no motion at the shoulder.

Other components with which pros-

thetists must reckon to enhance function are manually rotated wrist units to substitute for forearm rotation; disconnect units to allow easy interchange of various terminal devices, and wrist flexion units in bilateral amputees. In instances of below elbow loss with limited elbow flexion, prosthetist can angulate the artificial forearm to increase overall flexion.

This brief account does not do justice to the efforts of the prosthetist in making a good custom-fit socket. To avoid pressure areas by relief moulding, to fit a very narrow stump by creating a double-wall socket, to provide the greatest usefulness and comfort, these can only be attained with experience, knowledge and skill. The armamentarium of the prosthetist is also increasing, thereby contributing additional resources to the solution of special problems.

#### Adequate Training

Assuming then that the prosthetist has finally provided the patient with a proper arm, it is still not an effective tool. After a "checkout" test usually done by a therapist to seek out mechanical errors, training is in order. Nothing can be more ill advised than to waste the skill of the surgeon and prosthetist by sending a patient home without training him in the use of his device. Certain muscles must be made to act in new ways to effect useful movements of the artificial limb. This consciously directed muscle action becomes an unconscious natural movement only by training. It would not be necessary to dwell on this point, if it did not happen that patients still fail to utilize their devices because of lack of proper training. The patient is, therefore, referred to a therapist versed in this phase of rehabilitation, where he learns proficiency in carrying out the daily requirements of living and of his job. Alert to all contingencies, the therapist reports any difficulties, mechanical, medical or psychological during this period. Finally, after a period of training the therapist should proceed to test the efficiency of performance before the patient is discharged.

#### Vocational Demands

The best way to insure success of the venture is to keep the long-term objective in focus from the time the patient is seen. The essence of the proper prescription, as in all rehabilitation, is to attempt ultimately to bring the patient to his full social and vocational potential. In the long run, whether a patient dons his arm or hangs it in the closet, will depend on the everyday utility of the device, and in practical terms, its use as a vocational tool.

While the prosthesis is being prescribed, one question must be foremost. To what occupational use will the prosthesis be put? The answer will determine the type of material used in the harness and in the socket and the grasping or terminal device. If a man has no vocation, or if his vocation must be converted, then this question cannot be answered without early counseling. In this instance, the vocational counselor makes an important contribution to the cooperative effort. Lack of such early planning may end up in a tool which is not adapted to its work and which, consequently, will be discarded by its user.

As already mentioned, the terminal device is not arbitrarily chosen, but hinges upon the vocational activities of the disabled person. For utility in heavy work, a simple split hook of rugged design is necessary; in less heavy work, there are devices providing more function but less durability. In occupations involving public contact, a functional cosmetic hand is available. Occasionally, the habits of a previous wearer of an artificial limb may have to be taken into account in choosing between a utility device and a cosmetic one. For social and certain recreational activities, a cosmetic hand will be the best solution. Often, both hook and hand are required, except in bilateral amputees for whom hooks usually offer the best answer.

An attempt has been made to show that proper fitting of an artificial limb is a complicated undertaking and that many people contribute to the success of such a project. It is necessary to have

one individual responsible for the overall rehabilitation of the individual. This responsibility belongs to the physician, but equally important are the roles of the prosthodontist, therapist and vocational counselor in the outfitting of an amputee with a useful instrument.

### Case Reports

The following case reports are presented to illustrate some of the problems in this field.

**Case 1 — W.G.**: A forty-four year old male required a disarticulation of the left hand at the wrist, following an explosion in 1926. He worked as a chemical engineer. At the present time he is doing desk work. He was wearing a purely cosmetic device when seen. Besides his vocation, he was active at home in photography and mechanical work. Range of motion at the elbow and radio-ulnar joints was normal. Muscle strength was good. The stump was bulbous because of the presence of the styloids. There was no pain at the end of the stump. He was anxious to obtain a functional prosthesis. He was supplied with a single-wall plastic cuff, slit partly on the volar surface so as to admit the bulbous end of the stump. A functional cosmetic hand was provided for work. A second cuff with hook was necessary for his hobbies.

Ordinarily, to preserve rotation of the forearm, a double-wall socket would be the usual approach. However, since the cuff fitted so well that there was no slippage of the forearm during rotation, a double-wall socket was not deemed necessary. A single cuff with wrist disconnect for both terminal devices is not practical, because his stump was too long to accommodate a disconnect and yet preserve proper arm length. The hand is not durable enough for rough work.

**Case 2 — E.L.**: A thirty-eight year old female received a surgical amputation of the arm six inches below the axilla, because of a malignant growth of the elbow two years ago. Patient had worked as a tester of radio condensers. Her activities were mainly those of a housewife. She was quite anxious to obtain a job to help out her financial situation. The stump was not painful and both motion and muscle strength at the shoulder were excellent. Prosthesis consisted of a short plastic cuff to preserve as much shoulder abduction as possible, and the forearm was equipped with a wrist disconnect and split hook. A standard figure eight harness with dual controls activated the elbow and hook.

This patient presented a relatively simple problem for an above elbow amputation. Her motivation contributed to the solution, and she has been using her prosthesis extensively at home.

**Case 3 — F.D.**: An eighteen year old man suffered a compound fracture of the right forearm seven years ago, resulting in amputation just below the elbow. He had worn a below

elbow prosthesis for eighteen months without satisfaction, because he could not develop adequate flexion of the elbow. He hoped to go into salesmanship eventually. He presented himself to our clinic in the hope of obtaining a more nearly functional device. Length from the stump end to the lateral epicondyle measured thirty per cent of the forearm length of the sound side, somewhat less than three inches from the cubital fossa. Muscle strength and joint motion were adequate, and the stump was in good condition. A split socket type of forearm was ordered with a step-up elbow hinge to afford greater forearm flexion, in view of the short stump. A functional cosmetic hand was provided. In view of his projected vocation. After one month's training, he developed excellent facility in operating the terminal device, and obtained adequate elbow flexion for all purposes.

A standard below elbow prosthesis failed because it was not possible to fit the socket to a very short forearm stump and yet preserve elbow flexion. This limitation of motion occurs because soft tissue is crowded into the cubital fossa on flexion in the presence of a socket, and thus limits motion. A better device, the one provided, consisted in fitting a socket to the stump and joining its proximal end by means of a step-up hinge to a conventional forearm shell. This type of hinge has a mechanical advantage of about 1.7, so that for every 90 degrees of anatomical motion, about 160 degrees of mechanical flexion are obtained. This modification enhanced the utility of the device and yet preserved the single control for activating the terminal device.

**Case 4 — D.V.**: A thirty-four year old technician-receptionist lost her right arm above the elbow twenty-seven years ago. She had been wearing a purely cosmetic device which could be flexed manually. This prosthesis was totally useless for her work. She would use test-tubes by hanging them on a hook and add reagents with the left hand. X-ray cassettes were carried by tucking them into the right axilla. Examination of the rather thin, tapering stump revealed some atrophy of the scapular muscles. Range of motion was adequate. A double-wall socket of laminated fiber glass was prescribed. A dual control system activated the elbow joint and grasping devices. A wrist disconnect was incorporated into the forearm shell.

A split hook was supplied to enable her to hold test-tubes, x-ray cassettes and the like. By means of a wrist disconnect, she could replace this with a cosmetic functional hand when assuming her receptionist duties. The arm shell was constructed with a double wall to give good stability on a narrow stump, and yet afford a wide enough girth to house the elbow locking device.

### Summary

For its success, the replacement of an amputated limb is a procedure requiring supervision from many quarters. Rehabilitation begins in the operating room with the construction of a satisfactory stump, and ends in job placement with a device adapted to the needs of the patient. On the road to the final goal, the patient will profit much from a close

exchange of information and ideas between the physician in charge and the prosthetist. The therapist makes an important contribution in maintaining maximal residual function and then in training the patient to use the prosthesis efficiently. Finally, the vocational counselor gives direction to this training. This procedure must operate not spasmodically, but as an integrated effort.

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## Electromyography in Intervertebral Disc Protrusions

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and

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Washington, D.C.

Intervertebral disc protrusions with compression of the adjacent nerve root are frequent problems in medical management. Objective evidence of nerve root irritation is a valuable aid in the clinical evaluation of the group of patients thus affected. Other authors have indicated the value of electromyography as a means of determining the presence of nerve root compression<sup>1,2,3</sup>. This paper reviews the electromyographic findings in a series of eighty-three patients with suspected intervertebral disc syndromes. Electromyograms, myelograms and surgical findings are compared and discussed.

### Method

The electromyograms in all cases were recorded on either a six or eight channel Grass electroencephalogram model 3-A. Paper speeds varied from 1.5 to 6 cm. per second. The gain on the amplifier was set so that a 1 centimeter deflection represented 100 microvolt input. The amplifying system is composed of two pre-amplifiers dependent upon a battery source of power, and the third stage power amplification run from commercial 60 cycle current. This mechanism is condenser-coupled with a

push-pull circuit and is particularly well suited for the operation of the moving coil type of ink-writing oscillographs used in recording frequencies up to 70 cycles per second. It is noted that fibrillary potentials having a duration of only 1 to 3 milliseconds are not recorded by this method. Action potentials of normal or abnormal motor unit discharges, however, are readily observed using the foregoing described apparatus.

Needle electrodes were employed in all instances. These electrodes were constructed by soldering insulated copper wiring to 26 gauge,  $\frac{1}{4}$  inch hypodermic needles the hilts of which had been cut off to reduce the weight of the electrodes. The needles were inserted approximately 2 to 4 cm. apart along the center axis of the muscle bellies. The patient was grounded by a surface electrode placed over a bony prominence

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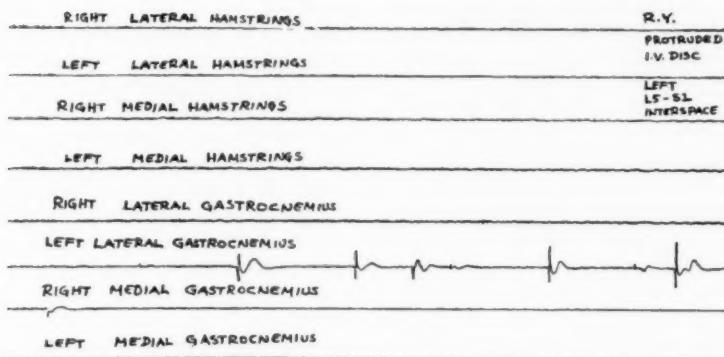


Fig. 1 — Electromyogram showing spontaneous polyphasic discharges localized to S-2 nerve root segment.

on the extremity tested, and was placed in a relaxed position on the examining table, using pillows for support under the knees or trunk as required for relaxation. In the upper extremities, the deltoids, biceps, triceps, flexor carpi radialis, extensor carpi radialis, opponens pollicis and abductor digiti quinti were most frequently sampled; in the lower extremities, the tibialis anticus, peroneus, gastrocnemii, quadriceps and hamstrings were selected. Simultaneous bilateral records of the extremities were taken in all instances. After suitable relaxation periods, varying from ten to twenty minutes, resting records were obtained. Responses to cough, Valsalva maneuver and voluntary motions were observed. Records were interpreted with knowledge of the clinical picture. Wherever possible, electromyogram recordings were made before myelograms were performed. In some instances, however, the myelogram was done prior to the electromyogram, because of circumstances beyond our control.

The interpretation of the electromyogram was based on the observation of frequent spontaneous polyphasic discharges at rest in a localized segmental nerve root distribution. An occasional fasciculation noted in widely separated muscle groups was not considered significant. A record was considered positive if it showed frequent discharge lim-

ited to one or two nerve root segments (fig. 1). Bilateral spontaneous discharges were noted in many patients with positive records despite the clinical picture of only unilateral compression. This phenomenon has been described by others<sup>4</sup>. A negative record was essentially electrically silent, or showed occasional rare discharges in segmentally unrelated muscle groups.

### Results

Eighty-three patients suspected of disc protrusion and nerve root irritation were examined electromyographically. Of this group, sixty-nine were male and fourteen female; with ages ranging from twenty-six to sixty-two years. In the group studied six patients were suspected of having cervical root lesions; the remaining seventy-seven had symptoms suggesting lumbar nerve root involvement. Of the total group, forty-one patients were treated conservatively, without myelogram or surgery. In this group the electromyogram was positive in fourteen, negative in twenty-two and inconclusive in five. In general, the findings agreed with the clinical evaluation. Of greater significance, however, is the comparison of the electromyographic findings with the myelographic observations or the observations at surgical exploration. These results are shown in tables 1 and 2.

Table 1 — Comparison of electromyographic interpretations, myelograms and the combined interpretations in 31 patients with intervertebral disc protrusion on whom surgery was performed.

	EMG Interpretation	Myelogram Interpretation	EMG and Myelogram Interpretation
Positive	25 (80.6%)	26 (83.8%)	30 (96.8%)
Negative	3 (9.7%)	2 (6.5%)	0
Inconclusive	3 (9.7%)	3 (9.7%)	1 (3.2%)

Table 2 — Comparison of electromyographic and myelographic findings in 11 patients who were not surgically explored.

	EMG Interpretation	Myelogram Interpretation
Positive	7 (63.7%)	3 (27.3%)
Negative	4 (36.3%)	6 (54.5%)
Inconclusive	0	2 (18.2%)

### Discussion

Hoefer and Guttmann<sup>2</sup> satisfactorily localized the level of spinal nerve root compression lesion, using the ink-writing electromyogram in seventeen of twenty-four cases. Brazier, Watkins and Michelson<sup>1</sup> in a series of ten cases of herniated cervical discs (confirmed by operation or myelography) obtained fairly correct results in all ten cases. However, the localization was not always precise, because of variation in anatomical distribution.

Hoefer and Cohen<sup>3</sup> in another series, obtained an accuracy of 83.1% with the electromyographic method of localization and of 85% by the use of myelography. Shea, Woods and Werden<sup>4</sup> obtained an even more precise series of localization by ascertaining the presence of fibrillary activity of denervation. This method correctly localized the lesion in sixty-eight of seventy-five cases (90%), whereas myelographic studies were accurate in only fifty-eight of sixty-eight cases (85.3%).

The study presented herein was not attempted for the purpose of localization of the lesions in suspected disc protrusions. Our efforts were largely confined to determining objective evidence of the existence of nerve root compression. Although in most instances the nerve root predominantly involved is identifiable, it has been our experience that anatomical localization is more accurately determined by a myelogram.

In the lumbar region the protruded disc may compress a root of the adjacent level or of a segmentally lower level, depending upon the size and direction in which the protrusion occurs. For example, a protrusion of the L-5 - S-1 intervertebral disc usually impinges upon the first sacral nerve root. In some instances, however, a lateral protrusion at this level may predominantly cause pressure on the fifth lumbar root. It is clear that the electromyographic evidence can assist only in identifying the root being compressed, and cannot determine the anatomical site of compression. Where a disc protrusion occurs in the cervical or thoracic spine, the anatomical location of the lesion is more readily determined. Because of the anatomical relationships between the nerve roots and intervertebral discs in the cervical and thoracic spine, a protruded disc in these areas will usually compress only the nerve root of the same segment.

In clinical practice, the problem of evaluating patients with suspected disc syndromes is often based on subjective findings, such as radiating pain, localized tenderness or hypesthesia. In the absence of objective neurological findings the clinician may not desire to subject the patient to the trauma of myelography. In these instances, electromyographic evidence of nerve root compression may be of valuable diagnostic aid. This is illustrated by the following case history:

A sixty year old white nurse was hospitalized with the clinical picture of left sciatic pain and lumbar tenderness, diagnosed as a ruptured lumbar disc with nerve root compression. After three weeks of observation, myelograms and surgery were being considered. Electromyography, however, was entirely negative and it was suggested that myelogram be deferred. Subsequent observations and psychiatric examinations revealed the probability of a conversion reaction. With intravenous sodium amytal interviews, and strong suggestion, the patient's symptoms disappeared.

In the foregoing instance the taking of a myelogram in an hysterical personality might have resulted in further fixation of her symptoms. Surgery would have been definitely contraindicated. The electromyographic record was the initial indication that her symptoms were out of proportion to the objective findings.

The results of these electromyographic studies suggest that a higher percentage

of disc suspects are confirmed when both electromyogram and myelogram are employed in diagnosis before surgery. Our figures indicate that over ninety-six per cent positive diagnoses were established where both electromyograms and myelogram were interpreted preoperatively. Using either diagnostic test alone, the percentages were below eighty-five per cent. Expressed another way, it might be stated that a small percentage of patients with negative myelograms will show positive electromyographic evidence of nerve root irritation, and conversely, negative electromyograms are occasionally reported in the presence of positive myelogram findings. Using a multiple channel ink-writer electromyogram, it is possible to complete an evaluation of two extremities, sampling all major muscle groups, in a relatively short period of time without any significant discomfort or trauma to the patient. It is, in our experience, a practical clinical procedure requiring less than an hour for complete sampling of the affected extremities.

Certain obvious limitations exist in the evaluation of nerve root irritation using the ink-writer electromyograph. The presence of occasional spontaneous fasciculations in normal subjects is a disturbing factor in the interpretation of the record. In unpublished data by one of the authors on normal subjects, occasional spontaneous motor unit discharges at rest in about seventy-five per cent of subjects tested were recorded. These were not confined to a single segmental level, but were widely distributed. The interpretation of occasional fasciculation in normal individuals is open to considerable discussion. In some instances these were related to fatigue.

An exact explanation is yet to be determined. Pre-existing neurological diseases, such as sub-clinical poliomyelitis, polyneuritis, or previous laminectomies may be a source of spontaneous motor unit activities, thus making the electromyographic records difficult or impossible to interpret. Another limitation of this method is found in the patient with severe pain and muscle spasm, making electromyography difficult or impossible because of inability of the patient to relax. This has been found to occur rarely. With proper positioning and suitable sedation, relaxation in almost all instances has been obtained.

The occurrence of spontaneous fasciculations associated with cough or Val-salva maneuver (fig. 2) is very suggestive of root compression. It is not present in all cases, but when elicited, in our experience, has always been a positive diagnostic sign.

The higher percentage of positive electromyograms as compared to myelograms in suspected patients not surgically explored suggests that the electromyogram may be a more sensitive index of nerve root irritation. It is reasonable to assume that minor compressions of a nerve root will give rise to fasciculations before an anatomical defect is noted in the X-ray. Our reports on the non-surgical cases bear out this impression (table 2).

#### Summary and Conclusion

An analysis is made of ink-written electromyographic recordings, using needle electrodes on eighty-three patients suspected of intervertebral disc protrusion and nerve root irritation.

The presence of spontaneous polyphasic discharges at rest in a localized

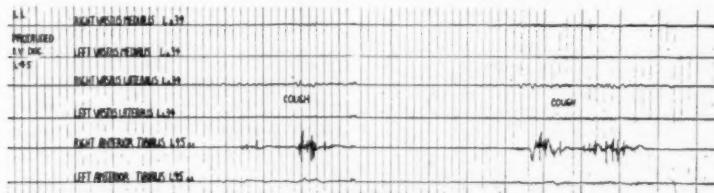


Fig. 2 — Electromyogram showing polyphasic discharges associated with cough in a localized nerve root segment.

segmental distribution in one or both extremities is interpreted as positive for nerve root irritation.

The appearance of polyphasic spontaneous discharges following cough or Valsalva maneuver occurs in a small percentage of suspected disc protrusions and is considered highly diagnostic of nerve root irritation.

The occurrence of spontaneous polyphasic discharges at rest in normal subjects is discussed and noted to have a widespread rather than a segmental distribution.

The utilization of electromyographic evaluation together with myelogram interpretation yields a higher percentage of positive findings in surgically proved cases than in either diagnostic method alone.

The presence of a completely negative electromyogram in the patient with subjective signs and symptoms of nerve root compression should lead one to explore other causes for the clinical picture.

Using needle electrodes and sampling major muscle groups of involved extremities with the ink-writer electromyogram is a clinically practical and useful diagnostic test in the evaluation of suspected intervertebral disc protrusions with nerve root irritation.

#### References

1. Brazier, M. A. B.; Watkins, A. L., and Michelsen, J. J.: Electromyography in Differential Diagnosis of Ruptured Cervical Disk. *Arch. Neurol. & Psychiat.* 56:651 (Dec.) 1946.
2. Hoefer, P. F. A., and Guttman, S. A.: Electromyography As a Method for Determination of Level of Lesions in the Spinal Cord. *Arch. Neurol. & Psychiat.* 51:415 (May) 1944.
3. Hoefer, P. F. A., and Cohen, S. M.: Localization of Cord Tumors by Electromyography. *J. Neurosurg.* 7:219 (May) 1950.
4. Shea, P. A.; Woods, W. W., and Werden, D. H.: Electromyography in Diagnosis of Nerve Root Compression Syndrome. *Arch. Neurol. & Psychiat.* 64:94 (July) 1950.

#### Discussion

Dr. Thomas P. Anderson (Hanover, N. H.): It should be noted the authors place emphasis on pointing out it was not the purpose of this study to localize lesions in suspected disc protrusions. It is this question of the accuracy of determining the level of the lesion which has brought considerable disfavor upon this type of clinical application of the electromyograph.

In this paper the authors present the electromyograph as an additional means of obtaining objective evidence of the existence of nerve root compression. When used for this purpose, it appears from their findings that the electromyograph provides real help in the clinical evaluation of cases of suspected intervertebral disc protrusion.

Considering such cases, one is often faced with the problem of whether or not a myelogram should be done in a patient with equivocal physical findings.

The electromyograph, as this study shows, can provide that additional information which can help in making a decision relative to myelography. The myelogram is not without some risk, whereas the electromyogram, as performed in this study, is completed in a relatively short period of time without any significant discomfort or trauma to the patient.

I would like to ask the authors two questions: are the findings of fibrillations in the involved muscles in cases of root compression, as reported by Shea, Woods, and Werden, of enough significance to warrant the use of a multiple channel cathode ray oscilloscope, which could show these fibrillations, instead of the ink-writer which is too sluggish to show fibrillation potentials?, and did the muscles in which fasciculations or polyphasic potentials were found in this study exhibit any weakness by manual muscle testing?

# MEDICAL NEWS

*Members are invited to send to this office items of news of general interest, for example, those relating to society activities, new hospitals, education, etc. Programs should be received at least six weeks before the date of meeting.*

## PERSONALS

On May 15-16, The Randolph High School, Randolph, Vt., held a Health Fair. **Thomas P. Anderson**, Hanover, N.H., spoke on the subjects, physical and occupational therapy. — The Massachusetts Medical Society heard **A. B. C. Knudson**, Washington, D. C., speak on physical medicine and rehabilitation in general practice. — **Arthur Abramson**, Bronx, N.Y., visited the VA Center at Bay Pines, Florida. In the afternoon, he addressed the medical staff and visitors on the subject "Physical Medicine and the Rehabilitation of the Paraplegic." In the evening, Dr. Abramson presented the topic "The Nature and Treatment of Spasticity." — At the June meeting of the American Rheumatism Association, held in San Francisco, a paper entitled "Neurology of Osteoarthritis of the Cervical Spine" was delivered by **Eugene Neuwirth**, Great Neck, N.Y. — **George C. Twombly, Jr.**, Denver, was recently appointed Director, Department of Physical Medicine and Rehabilitation, St. Joseph's Hospital, Denver. — The Academy of Medicine, Sao Paulo, Brazil, recently elected **Harvey E. Billig, Jr.**, Los Angeles, "socio correspondente estrangero deste sodalicio." — **Roy H. Nyquist**, Long Beach, Calif., recently attended the ninth class at the prosthetics training center, Department of Engineering, UCLA, for the training in upper extremity prosthetics. — The American Association of Rehabilitation Therapists appointed **J. L. Rudd**, Boston, Mass., to its Registry Board effective March 1, 1954. — **Irvin Neufeld**, New York City, delivered a paper entitled "Contributions of Individual Psychology to Psychosomatic Medicine" at the annual convention of the American Society of Adlerian Psychology in Chicago, May 8, 1954. — At the meeting of the Academy of Medicine, Cincinnati, **Howard A. Rusk**, New York City, discussed the topic "Dynamic Therapeutics in Chronic Disease." — **Vincent J. Sutch**, Kerrville, Texas, was chief speaker at the March meeting of the

Texas Chapter, American Association of Rehabilitation Therapists. His topic was "Rehabilitation of the Tuberculous Patient." — **Herbert Kent**, Sheppard AFB, Texas, presented the exhibit entitled "Respiratory and Air Evacuation Management in the USAF" at the AMA convention, San Francisco, June 21-25. — **Louis P. Britt**, Memphis, Tenn., presented a paper entitled "Physical Therapy in Office Practice" at the Tennessee State Medical Meeting, Nashville. — The New York chapters of the Association for Physical and Mental Rehabilitation and the American Association of Rehabilitation Therapists presented a clinical session with the topic "Research in Rehabilitation" in March. Arthur S. Abramson was chairman and **Edward Gordon**, New York City, was guest speaker.

## RECENT PUBLICATIONS BY MEMBERS

**Harry M. Hines**, with co-authors, "Effect of Ultrasonic Energy on Blood Flow." *American Journal of Physical Medicine*, April, 1954.

**Duane A. Schram**, "Assistive Apparatus for the Paralytic Hand." *The American Journal of Occupational Therapy*, March-April, 1954.

**S. Malvern Dorinson**, "Antidrool Mask for Children with Cerebral Palsy." *Journal of the American Medical Association*, May 29, 1954.

**Louis N. Rudin**, "Ultraviolet in Medical and Surgical Practice." *Current Medical Digest*, April, 1954.

**Ben L. Boynton**, "Refining Our Resources." *The American Journal of Occupational Therapy*, March-April, 1954.

**Robert W. Newman**, "Dislocation of the Shoulder Joint and Infracture of the Humeral Head." *The Journal of the Iowa State Medical Society*, May, 1954.

**Phillipe Bauwens**, "New Appliances: Finger Splint for Correcting Deformity." *Annals of Physical Medicine*, January, 1954.

Peter A. Volpe, "Rehabilitation Team of the Future." *American Archives of Rehabilitation Therapy*, March, 1954.

Frank H. Krusen, "New Trends in Physical Medicine Have Changed Our Approach to Chronic Illness." *Modern Hospital*, October, 1953.

A. B. C. Knudson, with co-author, "Concepts of Educational Therapy." *Department of Medicine and Surgery Information Bulletin*, April, 1954; with co-author, "Manual Arts Therapy Pioneers in Bridging the Gap Between Hospital and Industry." *Department of Medicine and Surgery Information Bulletin*, April, 1954.

Everill W. Fowlks, with co-author, "The Rationale of Interest Evaluation During the Rehabilitation of Patients." *American Archives of Rehabilitation Therapy*, March, 1954.

Herman Kabat, with co-author, "Spasticity: Its Nature and Treatment." *California Medicine*, April, 1954.

Allen S. Russek, with co-authors, "Risk of Thromboembolic Complications from Cortisone Therapy." *American Heart Journal*, May, 1954.

Leonard J. Yamshon, with co-author, "The Value of Professional Writing to a Profession." *American Archives of Rehabilitation Therapy*, March, 1954.

John H. Aldes, "Use of Betasamine As An Adjunct to Total Rehabilitation in Neuromuscular Diseases." *The Bulletin of The Biological Sciences Foundation, Ltd.*, April, 1954.

George Benson, with co-authors, "Physical Therapy in the Treatment of Tuberculous Patients Who Have Had Pulmonary Resection." *Department of Medicine and Surgery Information Bulletin*, April, 1954.

Howard A. Rusk, "Rehabilitation—Reconstruction." *Missouri Medicine*, May, 1954.

James W. Bulmer, "Posthospital Rehabilitation." *Department of Medicine and Surgery Information Bulletin*, April, 1954.

Igo H. Kornblueh and George M. Piersol, "The Vanishing Spas of Pennsylvania (An Historical Review)." *Transactions and Studies of the College of Physicians of Philadelphia*, August, 1953.

Michael M. Dacso, "Clinical Problems in Geriatric Rehabilitation." *Geriatrics*, April, 1953.

#### APPARATUS ACCEPTED

The following information relative to apparatus accepted by the Council on Physical Medicine and Rehabilitation of The American Medical Association is reprinted, with permission, from the May 22, 1954 issue of The Journal of The American Medical Association.

**M. S. A. Pulmonary Ventilator:** Mine Safety Appliances Co., Braddock, Thomas and Meade Streets, Pittsburgh 8.

The M. S. A. Pulmonary Ventilator is a device for administering oxygen under slightly positive pressure (up to about 30 cm. H<sub>2</sub>O) and for administering medicaments as aerosols by means of a nebulizer. It is fastened to a standing container of oxygen and includes a high-pressure reducing valve, high and low pressure gauges, a valve responding to the patient's inhalations and fitted with an indicating gauge, a single breathing hose with mouthpiece and exhalation valve, and a separately connected nebulizer with rubber tubing and control valve.

The essential feature is a pressure-compensated valve assembly that starts and stops the flow of oxygen according to whether the pressure in the patient's airways falls to a certain minimum or rises to a certain maximum; the latter figure is determined by setting an adjusting screw until the low pressure gauge gives the desired reading. The patient breathes through his mouth; some patients can do this by controlling their posterior nares without resorting to the use of a noseclip. A slight initial inhalatory effort starts the flow, but the patient relaxes while the flow continues until the predetermined pressure is reached. This may be 10, 20, or 30 cm. H<sub>2</sub>O; the most comfortable setting is between 15 and 20 cm. H<sub>2</sub>O.

The nebulizer is connected so that it delivers a stream of oxygen, carrying the aerosol, into the airway just adjacent to the mouthpiece.

The total weight of the equipment is 5.3 kg. (12 lb.). It is shipped in a carton measuring 20 by 45 by 30 cm. (8 by 18 by 12 in.) and weighing 6.6 kg. (14½ lb.).

**Zenith Super Royal-T Hearing Aid:** Zenith Radio Corporation, 5801 W. Dickens Ave., Chicago 39.

The Zenith Super Royal-T Hearing Aid contains three transistors as part of its amplification circuit. It uses no tubes. The power is supplied by a single 2.5 volt battery containing two mercury cells connected in series.

The body of the instrument measures 75 by 60 by 23 mm. and weighs 118 gm. The battery unit weighs 26 gm., the earphone 7 gm., and the receiver cord 2.5 gm., making the total weight 153.5 gm.

**Fortiphone Hearing Aid, Model 19 LR:** Fortiphone Limited, Fortiphone House, 247 Regent St., London W. 1, England.

Distributor: Anton Heilman, 75 Madison Ave., New York 16.

The Fortiphone Hearing Aid, Model 19 LR, has three vacuum tubes and requires one A-battery (1.2 to 1.5 volts) and two

B-batteries (22.5 volts each). It is provided with a receiver for bone conduction and an automatic volume control circuit that is intended to limit the maximum output of the instrument in order that sudden loud noises cannot reach the hearer's threshold for pain. The body of the instrument measures 127 by 64 by 25 mm., and with batteries weighs 282 gm.

**DeVilbiss Vaporizer, No. 146:** The DeVilbiss Company, P.O. Box 552, Somerset, Pa.

The DeVilbiss Vaporizer, No. 146, is an electrically heated container in which water is boiled; its capacity is about 900 cc. (2 pt.) of water. Steam issuing from the plastic cap is directed horizontally by a hole in the cap and passes over a pit or shallow excavation on the cap so that volatile substances placed therein are evaporated. It requires 60 cycle alternating current at 115 volts and draws 200 watts.

Packed for shipment the device weighs 900 gm. (2 lb.) and measures 21 by 16 by 16 cm. (8 by 6 by 6 in.); unpacked it weighs 780 gm. (1 lb. 12 oz.).

#### RESIDENCES IN PHYSICAL MEDICINE AND REHABILITATION

The Residency Information Bulletin, prepared by the Council on Medical Education and Hospitals, AMA, lists the following residencies in physical medicine and rehabilitation available immediately or through October 1, 1954. Further information and additional data regarding the programs can be secured by corresponding directly with the hospitals.

The location and number of residencies available and the persons to whom inquiries should be directed are as follows: VA Hospital, Denver, Colo., 1, Dr. C. C. Hoffman; VA Hospital, East Orange, N.J., 1, Chief of Professional Services; VA Hospital, Cleveland, Ohio, 1, Dr. L. Rose, Chief of Professional Services; VA Hospital, Memphis, Tenn., 2, Dr. J. S. Herring, Chief of Professional Services; VA Hospital, Houston, Tex., 1, Chairman, Res. Review Board; VA Hospital, Wood, Wis., 1, Dr. W. E. Zeit, Secretary to Deans Com., Marquette Univ. School of Med., Milwaukee; Univ. of Colorado Med. Ctr., Denver, 1, Office of Gradu-

ate and Postgraduate Med. Ed.; Georgia Warm Springs Fdn., Warm Springs, Ga., 2, Dr. R. L. Bennett, Med. Dir.; University Hospital, Ann Arbor, Mich., 2, Dr. J. W. Rae, Jr.; University of Minnesota Hospitals, Minneapolis, 4, Dr. F. J. Kottke; Mayo Foundation, Rochester, Minn., 4, Mayo Foundation; Barnes Hospital, St. Louis, Mo., 1, Dr. Sedgwick Mead; Bellevue Hospital Center, Div. III-New York Univ. College of Med., New York City, 4, Dr. J. Benton; Goldwater Memorial Hospital, New York City, 4, Dr. Howard Rusk; Goldwater Memorial Hospital, New York City, 3, Medical Superintendent; Hospital for Joint Diseases, New York City, 1, A. Rosenberg, Exec. Dir.; New York City Hospital, New York City, 1, H. E. Bauer, M.D., Medical Superintendent; St. Luke's Hospital, New York City, 1, Dr. L. H. Gaston, Exec. Dir., and Cleveland Clinic Hospital, Cleveland, 3, Admissions Committee.

#### CONGRESS NORTHWESTERN SECTION MEETS

The Northwestern Section of the American Congress of Physical Medicine and Rehabilitation held a meeting in Seattle, May 21-22, 1954. The following members participated: Everill W. Fowlks, Portland, was moderator of a Panel on Geriatric Problems; Arthur C. Jones of Portland spoke on "Ultrasonic Therapy."

#### PENNSYLVANIA ACADEMY OF PHYSICAL MEDICINE AND REHABILITATION

At the annual business meeting held in Philadelphia, May 20, 1954, the following officers were re-elected for the year 1954-1955: President, Albert A. Martucci; Vice-President, Francis J. Bonner, and Secretary-Treasurer, J. Murl Johnston.

#### ASSOCIATION FOR PHYSICAL AND MENTAL REHABILITATION

The eighth annual meeting held in Cleveland, June 28-July 2, included clinical demonstrations, panels and exhibits given on the following subjects: "Rehabilitation of the Hemiplegic"; "The Cardiac Patient and His Rehabilitation" and "Rehabilitation Following Repair of Shoulder Dislocations."

## IMPORTANT NOTICE TO CONGRESS MEMBERS

Please take notice that at the last annual business meetings of the Congress, September 1 and 2, 1953, Palmer House, Chicago, the following amendments to the Constitution were presented in writing. These amendments will be presented to the general membership for acceptance or rejection at the annual meeting, Hotel Statler, Washington, D.C., September 6-11, 1954.

### ARTICLE II — OBJECTS

Section 1.—The objects of the Congress are to promote and advance the art and science of physical medicine. Physical Medicine as here used means the diagnosis of, prescribing for, or treatment of disease, defect or injury by physical means.

Section 2.—As a "Congress," this organization shall be expected to function eventually as does the American Medical Association, in that state and sectional societies devoted to the advance of physical medicine may affiliate and become component societies participating through delegates in the control of the national Congress.

**Amend Article II, by deleting sections 1 and 2, and substituting the following:**

The objects of the Congress are to promote and advance the art and science of physical medicine and rehabilitation. Physical medicine and rehabilitation as here used means the diagnosis of, prescribing for, and treatment of disease, defect or injury by physical means; and restoration to the fullest physical, mental, social, vocational, and economic usefulness possible.

### ARTICLE III — MEMBERSHIP

Section 2 (b) — To be an Associate Member, a person shall be a physiologist, an electrical engineer or expert in the physics or biophysics of agents employed in physical medicine, and shall be invited by the Membership Committee.

**Amend Article III, Section 2 (b), to read as follows:**

To be an Associate Member, a person shall be a physiologist, a physicist, a biophysicist, an electrical engineer, a mechanical engineer, a chemical engineer, or any other expert, or research worker, or investigator or teacher in the field of physical medicine and rehabilitation and shall be invited by the Membership Committee.

### ARTICLE V — OFFICERS

Section 2.—Election and Tenure.—The voting members of the organization shall elect by such method or procedure as the By-Laws may provide the officers (as listed in Section 1, Article V) to serve a one-year term or until their successors are duly elected and qualify. Each of these officers shall assume office at the last business meeting of the annual session at which they were elected and shall serve until the corresponding period of the annual session next following their election. At the last business meeting of the annual session next following his election, the President-Elect shall assume the office of President, and serve as such until the corresponding period of the following annual session or until his successor assumes office.

**Amend Article V, Section 2, to read as follows:**

The voting members of the organization shall elect by such method or procedure as the By-Laws may provide the officers (as listed in Section 1, Article V) to serve a one-year term or until their successors are duly elected and qualify. Each of these officers shall assume office at the conclusion of the last business meeting of the annual session at which they were elected and shall serve until the corresponding period of the annual session next following their election. At the conclusion of the last business meeting of the annual session next following his election, the President-Elect shall assume the office of President, and serve as such until the corresponding period of the following annual session or until his successor assumes office.

### ARTICLE X — OFFICIAL PUBLICATION

Section 1. Name.—The official publication of the Congress is the **ARCHIVES OF PHYSICAL MEDICINE**, in which shall be published all official Congress notices and transactions of sessions of the Congress, either in abstract or in full. The management of the **ARCHIVES OF PHYSICAL MEDICINE** shall be vested in an Editorial Board to be constituted as provided for in the succeeding section.

**Amend Article X, Section 1, to read as follows:**

The official publication of the Congress is the **ARCHIVES OF PHYSICAL MEDI-**

CINE AND REHABILITATION, in which shall be published all official Congress notices and transactions of sessions of the Congress, either in abstract or in full. The management of the ARCHIVES OF PHYSICAL MEDICINE AND REHABILITATION and the direction of its policies shall be vested in an Editorial Board to be constituted as provided for in the succeeding section.

**Section 2. Composition of Editorial Board.**—The Editorial Board shall consist of six members appointed by the Board of Governors, one member to serve one year, one member to serve two years, one member to serve three years, one member to serve four years, one member to serve five years and one member to serve six years. Thereafter, as the term of a member of the Editorial Board expires, the Board of Governors shall appoint a successor to serve a six-year term.

**Amend Article X, Section 2, to read as follows:**

The Editorial Board shall consist of seven members appointed by the Board of Governors, one member to serve one year, one member to serve two years, one member to serve three years, one member to serve four years, one member to serve five years, one member to serve six years, and one member to serve seven years. A member appointed for a full term shall assume office at the close of the business meeting of the Congress following his appointment. Thereafter as the term of a member of the Editorial Board expires, the Board of Governors shall appoint a successor to serve a seven year term. If a member dies, resigns or is removed, the Board shall appoint a successor to serve the unexpired portion of the term and the member so appointed to fill the unexpired term shall assume office immediately following his appointment. At the annual meeting of the Editorial Board, a chairman shall be elected by the Board to serve a term of one year beginning at the conclusion of the business meeting of the Congress following his election.

#### ARTICLE XII — MEETINGS

The Congress shall meet at such times and places as may be provided in the By-Laws

provided there shall be held annually a meeting which shall be designated as the Annual Meeting at which the Congress shall elect members to succeed officers and committeemen whose terms expire at the beginning of the following meeting, and provided that the Board of Governors may subsequently by majority vote designate a different time and/or place accordingly as necessity, advisability or convenience may indicate. The Congress may be called into special session at any time during the year by the President on the written request of ten members.

#### Amend Article XII, to read as follows:

The Congress shall meet at such times and places as may be indicated in the By-Laws provided there shall be held annually a meeting which shall be designated as the Annual Meeting at which the Congress shall elect members to succeed officers and committeemen whose terms expire at the beginning of the following meeting, and provided that the Board of Governors may subsequently by majority vote designate a different time and/or place accordingly as necessity, advisability or convenience may indicate. The Congress may be called into special session at any time during the year by the President on the written request of twenty-five members.

\* \* \* \*

These amendments were submitted in accordance with Article XVI—Amendments of the Constitution which reads as follows:

"This Constitution may be amended in whole or in part at any annual business meeting by a two-thirds vote of all voting members present and voting provided that prior to that time the amendment —

(1) Has been presented in writing at the previous annual business meeting, and

(2) A copy of the proposed amendment, together with a notice that the matter will be voted on, is sent by mail to each member or is published in the ARCHIVES OF PHYSICAL MEDICINE not less than one month in advance of the annual business meeting at which action is to be taken."

## BOOK REVIEWS

*The reviews here published have been prepared by competent authorities and do not necessarily represent the opinions of the American Congress of Physical Medicine and Rehabilitation and/or the American Society of Physical Medicine and Rehabilitation.*

**SEX LIFE OF THE AMERICAN WOMAN AND THE KINSEY REPORT.** Edited by *Albert Ellis*, Ph.D. Cloth. Price, \$2.75. Pp. 214. Greenberg, Publisher, Inc., 201 E. 57th St., New York 22; Ambassador Books, Ltd., Toronto, Canada, 1954.

This is without a doubt one of the most refreshing books to date dealing with the latest Kinsey report. The book is a collection of opinions by very able experts in the field of sex and its environs.

Most interesting was the chapter on "Virginity and Premarital Sex Relations" by the noted author Philip Wylie. In addition to Mr. Wylie's views, he concludes his comments with the terse but thought-provoking statement, "Yet I am convinced that to teach people how to make love can accomplish little, either good or bad, until those same people first find out *how to love*."

Another section which makes this reviewer feel that its author had written it with tongue in cheek is the chapter on "Coital and Non-Coital Sex Techniques."

It is interesting to note that finally here is expounded and refuted the double standard of morals which has existed for men and women since the beginning of time. It is disturbing to learn, however, that after the exhaustive research made by the gentlemen from Indiana we are reduced to one basic concept and that is *sex for a man is an achievement and sex for a woman is sin!*

To anyone interested in an intelligent review of the current sex trend, this book will prove enlightening since it presents more than one view of the topic. It is recommended to those who would like to give mature consideration, in all its aspects, to the sexual behavior of the human female. It is astounding to think that the human male actually believes he understands and can cope with the human female. The human female is and always will be an unsolved problem.

**MODERN CONCEPTS IN MEDICINE.** By *Julius Jensen*, Ph.D., M.R.C.S., L.R.C.P. Cloth. Price, \$11.50. Pp. 636, with illustrations. The C. V. Mosby Company, 3207 Washington Ave., St. Louis 3, 1953.

This book provides a novel approach to the study of medicine; it should be called a philosophy of medicine rather than a textbook. The author feels that in the light of new medical knowledge all diseases should be related to basic physiologic principles. The book is at times a bit tedious. The illustrations consist mainly of chemical formulae.

The book is divided into four parts. Part I, the introduction, deals with the development of modern medical concepts, fundamental cellular activity, and the all-important principle of adaptation. "Life may be considered a constant state of adaptation. . . When the functioning of this adaptation is disturbed, there results a state which is called disease."

Part II discusses the essential processes of adaptation. It includes a detailed chapter on metabolism, followed by brief chapters on fluid balance, electrolyte balance, hydrogen-ion concentration, regulation of temperature, the immune reaction, and neoplasia.

Part III covers "Structural Facilities in Support of Adaptive Processes." Body structures in health and disease are outlined according to the fundamental processes which they serve, rather than on the basis of their structure. For example, the chapter on "Facilities for Early Metabolism" deals with the gastro-intestinal tract and its disorders; the chapter on "Facilities for Intermediary Metabolism" deals with the liver; and that on "Facilities for the Final Stages" deals with the lungs, their disorders and hemoglobin in its various aspects. Other chapters discuss kidney functions and dysfunctions; "Locomotor Facilities" or bones, muscles, and joints; structural responses to the immune reaction, and the transportation or cardiovascular system.

Part IV is titled "Cybernetics." The term is defined as that field of knowledge which deals with "control and communication in the animal and machine." Here are discussed the enzymes, vitamins, endocrines, and the nervous system, with a final chapter on "Western Man and Adaptation."

In the author's own words, "this book has been written to facilitate the understanding of internal medicine." This purpose has undoubtedly been accomplished. The book should be of great interest to the internist. Unfortunately, the subjects of greater interest to the physiatrist are dealt with rather briefly.

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**YOU AND YOUR SKIN.** By *Norman R. Goldsmith*, M.D. Cloth. Price, \$3.75. Pp. 148, with 6 illustrations. Charles C Thomas, Publisher, 301-327 E. Lawrence Avenue, Springfield, Ill.; Blackwell Scientific Publications, Ltd., 49 Broad Street, Oxford, England; Ryerson Press, 299 Queen St., W., Toronto 2B, 1953.

This very readable and well written book is full of good sound information which answers the many questions people have about their skin, hair, nails and allergies. The author skillfully informs the reader about normal and abnormal conditions of the skin, giving common sense advice on how to avoid the more usual troubles known to everyone and when to seek the advice of a dermatologist. The pitfalls to the advertiser and the untruth of superstitions are recognized by anyone. The book is obviously written for the patient, but physicians, particularly those doing general practice or student health, should enjoy and profit from reading it. It should also be on reading lists for students and teachers of health education.

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**SEX ETHICS AND THE KINSEY REPORTS.** By *Seward Hiltner*. Cloth. Price, \$3.00. Pp. 238. Association Press, 291 Broadway, New York 7, 1953.

Since Dr. Kinsey dropped his first bombshell book *Sexual Behavior in the Human Male* on the general, and at that time, unsuspecting public, the reader's market has been flooded with pro and con publications relative to his (Dr. Kinsey's) second herculean effort on the human female. Since the purpose of this publication is to evaluate the strengths and weaknesses of the Kinsey reports, according to information contained in the text, the book then assumes a "mugwump" attitude.

With sex rapidly becoming a parlor topic for discussion, this book may serve some useful purpose. This reviewer, however, failed to find anything of value in the work.

**WONDERS OF MODERN MEDICINE.** By *Steven M. Spencer*. Foreword by *George F. Lull*, M.D., Secretary and General Manager, American Medical Association. Cloth. Price, \$4.00. Pp. 276. McGraw-Hill Book Company, Inc., 330 W. 42nd Street, New York 36; 95 Farringdon Street, London, E. C. 4, 1953.

Here is a thoroughly fascinating book on the progress made by medicine in the past decade. The author has truly set forth, in an interesting and readable style, the "Wonders of Modern Medicine." Of particular interest are the chapters on *The Gamma Globulin Story*; *What's Gumming Up Our Arteries*; *The War on Cancer*, and *The Versatile Hormone*. This, in effect, does not mean that the rest of the material is without value. It is indeed difficult to make selection of which chapters can be considered better than others.

This publication is a definite *must addition* to any library. The format is excellent. It is highly recommended to all.

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**SOURCES OF INFORMATION AND UNUSUAL SERVICES: A GUIDE TO ORGANIZATIONS AND AGENCIES WHICH ARE SOURCES OF INFORMATION OF GENERAL AND NATIONAL INTEREST, OR WHICH RENDER UNUSUAL SERVICE.** Edited by *Jewel Alexander*. Third edition, 1954-55. Paper. Price, \$2.00. Pp. 64. Informational Directory Company, 200 W. 57th St., New York 19, 1954.

This is one of the most unique information directories ever published. Arranged by subject, it is a guide to organizations and agencies having information of general and nationwide interest. Within the pages of this booklet, one may run the gamut of services from "Accident Prevention" to "Yugoslavia."

The publication is well worth its price.

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**THE PHYSICS OF RADIATION THERAPY.** By *Harold Elford Johns*, M.A., Ph.D., F.R.S.C. Cloth. Price, \$8.50. Pp. 286, with illustrations. Charles C Thomas, Publisher, 301-327 E. Lawrence Ave., Springfield, Ill.; Blackwell Scientific Publications, Ltd., 49 Broad Street, Oxford, England; Ryerson Press, 299 Queen Street, W., Toronto 2B, 1953.

This book explains the physics of X-rays, radium, radioactive isotopes, and high energy particles as produced by the cyclotron, betatron, and synchrotron. The title might be misleading to some who would expect the book to include the physics of ultraviolet, infra-red, and diathermy. These latter types of radiation therapy are not discussed. The book is designed for the radiologist and his

co-workers, to serve as a text of specialized physics and to serve as a reference for basic data related to therapy.

Structure of matter, relations of mass and energy, and theories of radiation are presented in an easy and understandable fashion. The principles of X-ray production, absorption and measurement are covered in their theoretical aspects as well as their practical applications. Schematic diagrams aid the explanation of basic principles. Wiring diagrams and photographs supplement the discussions on clinical equipment.

Approximately half of the book is devoted to the clinical aspects of measurement of radiation, the quality of X-rays and radium, the effects of scattering media, distribution of dosage in multiple field applications, and gradient and differential tissue absorption. Tables and graphs are included to make available for quick reference concise data on depth dosage and isodose distributions.

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PROFESSIONAL PREPARATION IN  
HEALTH, PHYSICAL EDUCATION, AND  
RECREATION. By *Raymond Albert Snyder, Ed.D.*, and *Harry Alexander Scott, Ph.D.* Cloth. Price, \$5.50. Pp. 421. McGraw-Hill Book Company, Inc., 330 W. 42nd St., New York 36; 95 Farringdon St., London, E. C. 4, 1954.

This book was written for those individuals who are responsible for the selection and education of students of Health Education, Physical Education, and Recreation.

The greatest part of each chapter is devoted to education *per se* because the authors believe that each of the professions listed is an integral part of education. What applies to teacher preparation in general must also apply to the proper preparation in Health, Education, Physical Education, and Recreation.

It has no practical value in the library of most physicians but may have limited value to physiatrists who are teaching in universities, if they have courses for students in these three professions.

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THE AMERICAN SEXUAL TRAGEDY. By *Albert Ellis, Ph.D.* Cloth. Price, \$4.50. Pp. 288. Twayne Publishers, 34 E. 23rd Street, New York 10, 1954.

It is regrettable to say that this particular publication has nothing to offer. This is a rehash of what has been published over and over again in various women's publications, health magazines, and the like.

The first chapter runs from pages 15 through 17, then goes to pages 20 through 21, and back again to page 18, making the actual reading of the text a great effort.

METABOLIC AND TOXIC DISEASES OF THE NERVOUS SYSTEM: PROCEEDINGS OF THE ASSOCIATION, DECEMBER 12 AND 13, 1952, NEW YORK, N. Y. Research Publications, Association for Research in Nervous and Mental Disease, volume XXXII. Editors: *H. Houston Merritt, M.D.*, and *Clarence C. Hare, M.D.* Cloth. Price, \$10.00. Pp. 604, with 104 illustrations. Williams & Wilkins Company, Mount Royal and Guilford Aves., Baltimore 2, 1953.

As so many neurological diseases are a mystery as to etiology and consequently have no effective therapy, it is of particular importance that all known etiologic factors be recognized for purposes of prevention and treatment. In view of this, the present collection of papers is of great value since it brings to the reader the latest information on toxic and metabolic processes that are known to have significant effect in the function of the nervous system.

The subjects discussed include the effects of various endocrine glands including the parathyroid, pituitary, adrenal cortex, thyroid and thymus. Other chapters describe the effects of physical agents such as excessive heat and cold and ionizing radiation. The toxic effects of common drugs such as barbiturates, opiates, general anesthetics and alcohol are included as well as industrial poisons such as heavy metals and organic solvents.

Other chapters deal with metabolic disturbances of various types including those associated with liver disease, carbohydrate and potassium dysfunction, disorder of lipide, porphyrin and creatinine metabolism and the role of vitamin B and B<sup>12</sup> and related compounds in nervous system function.

Each paper is written by a known authority or comes from an outstanding research laboratory. The discussions are particularly illuminating and the papers are all well documented with modern references. There are numerous illustrative charts, diagrams and photographs and the printing and binding are of the same excellent quality as previous volumes in this series.

All neurologists will want this in their reference library and it will be a valuable text for all clinicians and investigators interested in neurological diseases.

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ROENTGEN, RADIUM AND RADIO-ISOTOPE THERAPY. By *A. J. Delario, M.D.* Cloth. Price, \$7.50. Pp. 371, with 65 illustrations and 155 tables. Lea & Febiger, Washington Square, Philadelphia 6, 1953.

This small, but ambitious volume contains a wealth of information on the physical as-

pects of Roentgen, Radium and Isotope Therapy. It represents a tremendous amount of work by its author. Most of the data has been taken from other text books and articles in the various fields of Radiation Therapy. Due credit to these sources is given and the bibliography is extensive. Those who expect to find detailed methods of treatment will be disappointed. However, sufficient space has been allotted to the fundamental knowledge concerning the biological effects of irradiation. The effects of exposure to an atomic explosion are described.

This book should prove particularly valuable to radiologists, dermatologists and other physicians using these modalities of treatment. It is a ready reference and a practical explanation of the principles of the radiation physics involved. The numerous charts and graphs serve to summarize and clarify the material contained in the text.

The author is to be congratulated on his industry in summarizing concisely into a single volume the most useful information in this new and rapidly expanding field.

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**DESIGN FOR DECISION.** By *Irwin D. J. Bross*. Cloth. Price, \$4.25. Pp. 276, with illustrations. The Macmillan Company, 60 Fifth Avenue, New York 11, 1953.

*Design for Decision* is a non-mathematical exposition of the principles of statistics by the statistical consultant to the Cornell University Medical College. It consists of fifteen chapters and a short carefully selected bibliography for those interested in the more technical aspects of the subject. The style of the book is almost conversational, being informal, direct and personal. The illustrations are drawn for the most part from the homely experiences of common man. The text is flavored with humorous asides. By the author's own admission, the book contains both sense and nonsense. Some readers will find the latter annoying.

*Design for Decision* is not for the individual with utilitarian interests in the techniques of a complex research tool. It is, however, extraordinarily important to physiatries precisely because the approach is philosophical rather than technical. Its techniques are still being evaluated subjectively by enthusiasts of that method of medical practice. The book provides the conceptual framework needed to prove the advantages of physical forms of treatment to a skeptical audience.

The introductory chapters are especially interesting. Bross depicts man as a decision-making animal. He considers the process of selecting one action from a number of alternative courses of action an intellectual mechanism based on the scientific method. To avoid the confusions which arise out of the

expression of ideas in verbal terms, real world problems are translated into symbolic language, the problem is solved in symbolic form, and the answer is then translated back into a real world decision. Man's built-in biological decision-makers have been replaced largely by cultural decision-makers and an increasing reliance on specialists who make decisions affecting many individuals. However, our particular civilization holds that it is the privilege, responsibility, and right of each individual to make his own decisions. Thus, because such exaltation of individual decision may lead to disastrous consequences, it is important for the individual to learn the principles underlying successful decision.

The uninitiated will find the sections dealing with experimental design most helpful. How to collect good data, the "fuel of the Decision-Maker," is replete with useful hints. Flaws in collecting and recording techniques may render data worthless. Because dogmatic points of view abound in physiatries, particular attention needs to be directed at the development of critical attitudes toward data. *Design for Decision* introduces the reader to the statistical methodologies which help him evaluate evidence and draw conclusions wisely. To some it will open the door to a new way of looking at the world in which we live and provide a stimulating guide to action in that world.

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**PROGRESS IN FUNDAMENTAL MEDICINE.** Edited by *J. F. A. McManus, M.D.* Cloth. Price, \$9.00. Pp. 316, with illustrations. Lea & Febiger, Washington Square, Philadelphia 6, 1952.

The purpose of this book is to bring together in one volume a summary of significant recent contributions to medicine by authorities who are able to evaluate them. Each chapter is closed with a comprehensive list of references. Titles of the chapters and their authors should make clear the importance and value of this book.

Recent Advances in Parenteral Nutrition with Particular Reference to Protein Hydrolysates. Paul R. Cannon.; Melanotic Tumors of the Skin. J. A. Cunningham.; Pathology of Systemic Lupus Erythematosus. Paul Klemperer.; The Diagnosis of Fungus Infections with Particular Reference to Staining Methods. Albert M. Kligman.; The Liver. G. K. Mallory and T. B. Mallory.; A Survey of Techniques for the Histochemical Approach to Pathology. J. F. A. McManus.; Coronary Artery Disease. J. C. Paterson.; The Problem of Carcinoma in Situ with Reference to the Human Cervix Uteri. Leland D. Stoddard.; The Recognition of Carcinoma in Situ of the Cervix Uteri by Papanicolaou's Method. W. Kenneth Cuyler, and Non-Silica Pneumoconioses. J. P. Wyatt.

The book is highly recommended.

THIRD ANNUAL REPORT ON STRESS. By *Hans Selye, M.D., Ph.D.* (Prague), D.Sc. (McGill), F.R.S. (Canada). Fabrikoid. Price, \$10.00. Pp. 637, with illustrations. ACTA, Inc., Medical Publishers, 1520 Mountain St. Branch, Montreal, Que., Canada.

This is a "gold mine" of material sources for any professional person who is interested in stress mechanisms. Like its predecessors "STRESS," AROS-1951 and AROS-1952, it brings all the material available into one up-to-date volume. It contains the bibliography of 5741 scientific productions.

The bibliography is arranged by subject matter as well as by author. The subject matter is usually arranged in order, with the target first followed by the stressor and/or stimuli. Sometimes there is more than one stressor or stimuli. In cases of disease, it is listed first in the subject index followed by the drugs, stressors, or stimuli.

There is an introduction followed by an excellent review of "The Stress Concept of 1953." These two chapters are followed by a few pages of definitions and terminology.

This is not a book to be read as the author so states. It is rather a handbook of ready references to a complete listing of all the publications related to the field of stress. It should be at the finger tips of all the workers in the field and available in every medical or scientific library. With few exceptions, there are no reviews or evaluations of this mass of literature.

MICHAEL SERVETUS: A TRANSLATION OF HIS GEOGRAPHICAL, MEDICAL AND ASTROLOGICAL WRITINGS WITH INTRODUCTIONS AND NOTES. By *Charles Donald O'Malley*. Cloth. Price, \$3.00. Pp. 208, with 5 illustrations. American Philosophical Society, Independence Square, Philadelphia 6, 1953.

Servetus was born in Tudela, Spain, about 1511. He traveled throughout Europe and was connected with many universities. Because of his baiting of Calvin, the latter succeeded in having him burned at the stake on October 27, 1553.

"The Syrups" is an interesting chapter. Syrups require proper use to obtain "correct balance of the four humors, or juices, in the blood" when disease has upset the balance. Servetus gives the first printed account of the circulation of the blood through the lungs in "Christianismi Restitutio." The combination of religion, geography, astrology and medicine in the various treatises makes for delightful reading.

The author, Professor O'Malley, of Stanford University, Palo Alto, California, is an able historian and student of Renaissance medicine.

BLACK'S MEDICAL DICTIONARY. By *John D. Comrie, M.A., B.Sc., M.D.* and *William A. R. Thomson, M.D.* Twenty-first edition. Cloth. Price, \$7.00. Pp. 1013, with 416 illustrations. The Macmillan Company, 60 Fifth Avenue, New York 11; A. & C. Black, Ltd., 4-6 Soho Sq., London, W.1, 1953.

This new and revised twenty-first edition of this particular dictionary has been prepared by our able English colleagues. In the preface, it is stated ". . . the aim has been to preserve what is good in the old and to add only those recent advances which would appear to be standing the test of time."

Included is a section on special suggestions for use of this dictionary which should prove helpful to those utilizing it. The type is easy to read and each defined word is set in bold face capitals. Numerous cross references are listed. It is regrettable, however, that the publication is not indexed for easy handling.



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## PHYSICAL MEDICINE ABSTRACTS

### A Placebo-Controlled-Study of Ultrasound Treatment for Periarthritis. E. E. Mueller; S. Mead; B. F. Schulz, and M. R. Vaden. Am. J. Phys. Med. 33:31 (Feb.) 1954.

Although voluminous and covering a wide variety of conditions, little of the European literature advocating the use of ultrasound has based its claims for the use of this new modality on controlled investigation. This has produced considerable skepticism in those who have recently become acquainted with this new form of physical therapy.

To avoid condemning a new modality without a fair trial, workers in this country in the past two years have sought to re-evaluate the use of ultrasound in some of the most favorably reported conditions. As a whole, these studies have been concerned with the arthritides. Although more information and more consistency as to dosage, technic of application and number of treatments required has been provided, these workers have likewise been uncritical in their evaluations. None has made a truly controlled study wherein half the study group received placebo treatment and the other half ultrasound, and in which objective evaluation of improvement was carried out by an observer ignorant of the patients serving as controls and those acting as experimental subjects.

The purpose of this study was to carry out a controlled investigation on patients suffering from periarthritis using objective criteria to evaluate improvement and statistical treatment of the data to determine significance of the results.

A total of fourteen patients comprised the group. These were selected only on the basis of unilateral shoulder involvement, and a willingness to participate for the entire duration of the project and to forego all supplemental treatment or medication during the experimental period. The age of the patients ranged from 36-74 years and the duration of their symptoms from seven weeks to six years. A wide variety of factors contributed to the periarthritis.

For purposes of closely matching patients, four classifications based on the amount of pain and limitation of motion present were devised. The patients presenting themselves for treatment fell into only two of these categories. There were seven patients in the one category and seven in the other. In each of these categories four received ultrasound and three were controls.

Each patient was given an examination by a physician who designated his classification. At the end of the treatment period, the physician rated the patients as improved, unchanged or worse. Just prior to the first treatment each patient was evaluated and scored by a second member of the team. Patients were evaluated at the end of the first week's treatment and again at the end of the second week. Evaluation consisted of scoring on an arbitrary scale of -75 to +75. One third of the total score was based on the patients' subjective impressions and two-thirds on performance tests and goniometric measurements of active range.

Subjective ratings consisted of numerical scores based on the patients' replies to questions such as: the presence and amount of pain at rest and on motion, the amount of medication taken to relieve pain, etc. Performance tests included such activities as climbing up a finger ladder in flexion and abduction, clasping the hands behind the head, etc. In goniometric measurements point values were assigned to each ten degrees. In scoring for all tests, doubtful changes were not recorded.

The third member of the team performed the treatments and selected the patients who would act as controls. Treatment for the control group was identical to that of the experimental group. In the latter group, the power was not turned on. A massage technic with mineral oil as a coupler was applied to an area of about a six inch radius from the tip of the shoulder. The dosage was 2.0 watts/cm<sup>2</sup> for five minutes. Treatment was daily five times per week for two weeks. Neither the physician nor the scorer knew which patient received treatment or placebo.

nor which patients comprised either the control or experimental groups.

When the completed evaluations were treated statistically, no significant improvement in either group was found. The conclusion was that ultrasound had no value in the treatment of periarthritis at the dosage described.

**Acute Potentials in Muscular Atrophy of Neurogenic Origin.** Fritz Buchthal, and Paolo Pinelli. *Neurology* 3:591 (Aug.) 1953.

It is well established that electromyography can be of considerable aid in the diagnosis and prognosis of muscular atrophies caused by affection of the lower motor neuron. In these cases, in contrast to normal muscle and myopathies, individual action potentials can be discriminated during maximal effort without interference from the discharge of neighboring motor units; an increase in the duration of the individual action potentials has been found, and spontaneous discharges of short duration occur in the apparently relaxed muscle. These fibrillation potentials are considered specific for partial or total denervation.

Duration, shape and amplitude of muscle action potentials recorded during voluntary effort have been studied in sixty-seven cases of muscular atrophy of neurogenic origin. In most cases (60 per cent) with atrophies caused by involvement of the anterior horn cells, there was an increase in both mean duration and amplitude of the action potentials. This increase was more pronounced as the stage of the disease was more advanced, and there was significant increase in all cases with marked atrophy. A correlation was found in these cases between the mean duration of action potentials and the degree of synchronization of action potentials from different motor units. In view of this finding, it seemed possible that a slight temporal dispersion of nearly coincident discharges from different subunits might account for the increase in duration of the action potentials in spinal atrophy.

In atrophies caused by peripheral nerve lesions, a statistically significant increase in mean duration was found in sixteen of thirty-four cases and was generally associated with normal amplitude of action potentials. The presence of an increase in mean duration was not correlated with the severity or the duration of the disease, nor were the cases with normal action potential parameters different in any way from those with alterations. It seems most plausible to assume an increase in temporal dispersion of the activation of fibers within the same subunit, due to changes in end plate, delay or impulse propagation over the muscle fiber.

**Studies on the Effect of Exercise on Cardiovascular Function III. Cardiovascular Response to Exercise in Patients with Healed Myocardial Infarction.** Carlton B. Chapman, and Robert S. Fraser. *Circulation* 9:347 (Mar.) 1954.

It is now well established that patients with acute myocardial infarction show profound circulatory changes. Some such patients, after surviving the acute episode, pass insidiously into cardiac failure and exhibit the usual hemodynamic alterations that are known to be associated with that state. Still others may recover from the acute phase of the disease only to be partly disabled later by angina pectoris. Whether or not there is a residual hemodynamic defect in patients with healed myocardial infarction, who are asymptomatic is uncertain, although marked limitation of activity used to be routinely recommended for them. Such patients often show no sign of cardiovascular disability and, unless advised to the contrary, are able to take up very active lives after recovery from the acute event. The hemodynamic response of such individuals to exercise may differ from that of persons who have not had a myocardial infarction.

In order to examine this possibility, study was made of nine men, between 45 and 60 years of age, all of whom had sustained a myocardial infarction at least six months before the test and on twelve men in the same age group, none of whom showed any evidence of cardiovascular disease of any type.

Patients with healed myocardial infarction, but who are asymptomatic, are for the most part, able to complete an exercise test involving moderate physical exertion lasting for a minimum of ten minutes.

The response of the cardiac output, mean circulation time, and blood pressure to such an exercise stress is substantially the same, quantitatively and qualitatively, as the response in comparable normal individuals.

The relatively marked increase in pulse rate in such patients during the exercise test is probably a manifestation of prolonged physical inactivity rather than of permanent cardiovascular disability.

The exercise test as used in the present studies provides no support for the view that marked restriction of activity is physiologically necessary in patients of this type.

**The Laryngeal Microphone as an Aid to Treatment of Bulbar Poliomyelitis.** F. D. Scott. *Brit. M. J.* 2:1414 (Dec.) 1953.

The prime requirement in the treatment of bulbar poliomyelitis is the maintenance of a clear airway. McDowell and Wolf, in 1953, have advocated early tracheotomy as a prophylactic measure in bulbo-spinal cases as Galloway did in 1947.

In this article, the author states that the frequency with which tracheotomy may be needed should be much reduced if the technique of detecting and removing obstruction is improved.

The need for a continuous watch over the patient to detect obstruction at the earliest possible moment has been stressed by Ritchie Russell. If this can be done and adequate postural drainage in the prone position is used, most cases of bulbar poliomyelitis uncomplicated by failure of respiratory muscle can be kept fully ventilated without tracheotomy.

First indications of obstruction are not, however, easily detected, especially if there is much other noise in the ward. To eliminate this source of danger, an instrument has been developed to amplify respiratory sounds so that the slightest obstruction is immediately apparent. It has been tried out in two epidemics and has proved to be of great value.

The instruments consist of a standard pattern of U.S. Air Force laryngeal microphone (Type ZA 19734) together with an amplifier and loudspeaker. They are readily obtainable in many shops handling radio equipment.

**Muscle Action Potentials in Polymyositis.**  
Fritz Buchthal, and Paolo Pinelli. *Neurology* 3:424 (June) 1953.

The recent description of virus infections similar in symptomatology to poliomyelitis, but characterized by extensive lesions in skeletal muscle, has aroused new interest in the study of inflammatory reactions of skeletal muscle. Primary inflammatory processes have been described in polymyositis and dermatomyositis. In a number of myopathies, inflammation may occur secondarily, e.g., in progressive muscular dystrophy and myasthenia.

It is well known that the clinical diagnosis of the subacute and chronic phases of polymyositis can be extremely difficult since symptoms are nonspecific, and in a number of cases there is not the characteristic involvement of the skin. Therefore, the diagnosis must be based on muscle biopsy.

In eleven cases of histologically verified polymyositis, the mean duration of muscle action potentials showed a statistically significant decrease of up to sixty per cent as compared with normal muscle from subjects of the same age. There was an increased occurrence of diphasic action potentials of short duration. This decrease in mean duration was attributable to the inflammatory aspect of the pathologic process. It seemed most likely that they could be accounted for on the basis of a general increase in propagation velocity of the impulse over the muscle fiber combined with a reduction in the functional length of the fiber.

**Physical Medicine and Rehabilitation for the Chronically Ill.** Frank H. Krusen. *J. Am. Geriatrics Soc.* 2:75 (Feb.) 1954.

Chronic illness and the medical problems of the aging are increasing enormously. Greater and more extensive general employment of physical, mental and social rehabilitation of the chronically ill is of the utmost importance. An attitude of passive acceptance and neglect of chronic illness should be abandoned and substitute an attitude of optimism and vigorous dynamic rehabilitation of aged and chronically disabled persons. Physicians and laymen alike should support the development of the fascinating and interesting new phase of medicine, known as physical medicine and rehabilitation, in the management of patients handicapped by chronic illness or injury. Proper rehabilitation of the chronically ill will result in enormous benefits both to patients and community.

In rehabilitation of the chronically ill, ever-increasing consideration should be given to this philosophy of treating each patient "as a whole" and to the importance of considering not only the physical but also the psychologic and social aspects of the illness of each chronically disabled patient. A broadening of our medical concepts, which recognizes that it is the obligation of the physician and the hospital to take the lead in caring for each patient from the beginning of his illness or injury until he is restored physically, mentally, socially and economically to the fullest possible productivity, is apparent. To meet and to fulfill this new conception, our general hospital departments of physical medicine and rehabilitation, and particularly those connected with teaching centers, must develop combined programs of good practice, proper teaching and satisfactory research.

**The Relationship of Oxygen Consumption to Cerebral Functional Activity.** Joseph M. Garfunkel; Henry W. Baird, III, and Joseph Ziegler. *J. Pediatrics* 44:64 (Jan.) 1954.

This paper summarizes the results of thirty-six determinations of cerebral blood flow and cerebral oxygen consumption in thirty-three subjects in the pediatric age group. Most of the patients had severe defects of the central nervous system. The results indicate that there is a direct correlation between cerebral oxygen consumption and mental ability. An adaptation of the Kety nitrous oxide method for determining cerebral blood flow is described; the method is practical and safe for use with infants and children. Theoretical aspects of the relation of cerebral metabolism to cerebral functional activity are discussed.

**Bulbar Polio - Manifestations and Residual Disabilities.** Arthur D. Berman, and John A. Kirchner. Connecticut M. J. 17:655 (Aug.) 1953.

Fifty-eight cases of poliomyelitis with bulbar involvement treated at New Haven Hospital between 1921-1951, were analyzed to determine (1) the usual presenting signs and symptoms; (2) mistaken diagnoses and, (3) frequency of residual disabilities in the musculature innervated by the cranial nerves. In this series, as in other reported series, it was the rare patient who exhibited symptoms limited to the bulb alone. In most cases, the bulbar symptomatology was combined with spinal involvement, involvement of the higher centers, or (in the majority of cases) both. Bulbar involvement was present in at least seventy-eight per cent of the cases, spinal involvement in seventy-six per cent, and encephalitic symptomatology in eighty-five per cent. Only one patient exhibited signs of bulbar involvement alone, with no spinal or encephalitic symptomatology.

Of the fifty-eight cases in this study, twenty-one died. Seven of those recovering were inadequately followed up after discharge from the hospital. Of eleven patients exhibiting dysphagia during hospitalization, the symptom cleared in every case on follow-up.

Prognosis for recovery of function in other cranial nerve palsies is likewise good. Extraocular muscle weakness exhibited by six patients, while in the hospital, and by one on discharge cleared in every case except one. Of fifteen patients exhibiting facial palsy during the hospital course, seven recovered their function, while one patient discharged without this sign exhibited a lower facial weakness when seen years later. Four of the patients had follow-up examinations which terminated less than six months after discharge. Hypoglossal nerve palsy seen in six patients during hospitalization persisted in only one patient.

Symptoms referable to involvement of

higher cerebral centers (polio-encephalitis) were interesting in that diminution of I.Q., inadequate adjustive mechanism, inability to concentrate and nervousness were seen years after discharge in a number of patients who presumably were discharged without these symptoms.

**Simultaneous Direct and Indirect Blood Pressure Measurements in Man at Rest and Work.** Austen Henchel; Frederick La Vega, and Henry Longstreet Taylor. J. Appl. Physiol. 6:506 (Feb.) 1954.

This study was undertaken to determine the accuracy of the indirect method of blood pressure measurements during rest, exercise and recovery. The indirect blood pressure was measured by the usual clinical method of auscultation using the arm cuff and an aneroid gauge. The direct blood pressure was measured by inserting a twenty gauge needle into the radial artery and connecting this needle to a Sanborn manometer with a polyvinyl tube. The blood pressures were recorded using the two methods with the subject at supine rest, standing, walking on a tread mill, and again at supine rest during the recovery period. The systolic blood pressures as measured by the two methods were comparable during supine rest. The auscultation method underestimated the true blood pressures while the subject was standing or at work and overestimated the true blood pressure during the first few minutes of the recovery period. The diastolic blood pressures recorded by the auscultation method were much lower during work and recovery than were the directly recorded blood pressures. This study indicates that there are systematic errors of some consequence with the indirect method of measuring blood pressure during work and during the recovery period. This would infer that the indirect method of measuring the blood pressure for fitness appraisal and cardiovascular performance is of doubtful value.

PRELIMINARY PROGRAMS  
of the  
**AMERICAN CONGRESS OF PHYSICAL MEDICINE  
AND REHABILITATION**  
**AMERICAN SOCIETY OF PHYSICAL MEDICINE  
AND REHABILITATION**

ANNUAL SESSIONS



Hotel Statler  
WASHINGTON, D. C.  
September 6-11, 1954



## AMERICAN SOCIETY OF PHYSICAL MEDICINE AND REHABILITATION

### Preliminary Program

#### SCIENTIFIC SESSION

TUESDAY, September 7 — 9:30 A.M.  
South American Room

Presiding — A. RAY DAWSON, Richmond, Va.  
Assisting — URSULA LEDEN, Dallas, Texas

Introduction and Welcome to the Advisory Committee  
on Artificial Limbs of the National Academy of  
Science, National Research Council.

DONALD L. ROSE, M.D., President, American  
Society of Physical Medicine and Rehabilitation;  
Department of Physical Medicine, University of  
Kansas School of Medicine, Kansas City, Kans.

Developments of Technics in Management of Upper  
and Lower Extremity Amputees.

#### Introduction

GENERAL F. S. STRONG, JR., Executive  
Director, Advisory Committee on Artificial Limbs,  
National Academy of Science, National Research  
Council, Washington, D. C.

#### Presentation

SIDNEY FISHMAN, M.D., Director, Prosthetic  
Devices, Advisory Committee on Artificial Limbs,  
National Research Council, Washington, D. C.

#### SCIENTIFIC SESSION

TUESDAY, September 7 — 2:00 P.M.  
South American Room

Presiding — SHELBY GAMBLE, Cleveland  
Assisting — LOUIS B. NEWMAN, Chicago

Physical Medical Aspects in Third Degree Burns.

CHARLES S. WISE, M.D., Professor of Physical  
Medicine and Rehabilitation, George Washington  
University School of Medicine,  
and  
GORDON S. LETTERMAN, M.D. (by invitation),  
Department of Surgery, George Washington  
University School of Medicine, Washington, D. C.

#### Psychogenic Rheumatism.

EDWARD W. LOWMAN, M.D., Clinical Director,  
Institute of Physical Medicine and Research,  
New York University-Bellevue Medical Center,  
New York.

The Arthritic Foot: A Method of Taking Weight-  
Bearing Impressions for the Making of Supports.  
ROBERT MULLER, M.D., New York.

*Open discussion of the papers presented during afternoon session will be made from the floor.*

American Society of Physical Medicine and Rehabilitation, Annual Business Meeting  
and Dinner (members only), Tuesday, September 7, South American Room, Hotel Statler.

# AMERICAN CONGRESS OF PHYSICAL MEDICINE AND REHABILITATION

*Thirty-second Annual Scientific Session and Instruction Seminar*

## Preliminary Program

### SCHEDULE OF INSTRUCTION SEMINAR

TUESDAY, SEPTEMBER 7

Hemiplegia — Painful Low Back

9:00 Physiology of Cerebral Circulation. KETY. Pan American Room.  
9:00 Functional Anatomy of the Spine. SOLNITZKY. California Room.  
10:00 Anatomy of Cerebral Circulation. SOLNITZKY. California Room.  
10:00 Management of Acute Low Back Pain without Radicular Pathology. KRAUS. Pan American Room.  
11:00 Acute Management of Hemiplegia and Prevention of Deformities. GUREWITSCH. Pan American Room.  
11:00 Manipulative Techniques of the Spine and Indications for Use. MENNELL. California Room.  
2:00 Gait Training for the Hemiplegic. PESZCZYNSKI. Pan American Room.  
2:00 Back Braces. von WERSOWETZ. Pan American Room.  
3:00 Prospects for the Hemiplegic Arm. GORDON. Pan American Room.  
3:00 Diagnosis and Indications for Surgery in Disc Disease. SCHLESINGER. California Room.  
4:00 Practical Management of Aphasia. SCHUELL. Pan American Room.  
4:00 Back Pain and Disability as a Compensation Problem. O'CONNOR. California Room.

WEDNESDAY, SEPTEMBER 8

Hemiplegia — Osteoarthritis

8:00 Activities of Daily Living for the Hemiplegic Patient Including Self-Help Devices. COVALT. Pan American Room.  
8:00 Pathogenesis and Medical Management. SOLOMON. California Room.  
9:00 Vocational Prospects for the Hemiplegic. GARRETT. Pan American Room.  
9:00 Therapy in Physical Medicine. WATKINS. California Room.

### LECTURERS FOR INSTRUCTION SEMINAR

DONALD A. COVALT, M.D., Associate Professor, Department of Physical Medicine and Rehabilitation, New York University College of Medicine; Associate Director, Institute of Physical Medicine and Rehabilitation, New York University-Hellevue Medical Center, New York.  
JAMES F. GARRETT, Ph.D. (by invitation), Chief, Division of Program Services, Office of Vocational Rehabilitation, Department of Health, Education and Welfare, Washington, D.C.  
EDWARD E. GORDON, M.D., Department of Physical Medicine and Rehabilitation, College of Physicians and Surgeons, Columbia University; Medical Director, Institute for the Crippled and Disabled, New York.  
A. DAVID GUREWITSCH, M.D., New York.  
SEYMOUR S. KETY, M.D. (by invitation), Scientific Director, National Institutes of Mental Health and Neurological Diseases and Blindness, National Institutes of Health, Bethesda, Md.; Professor of Clinical Physiology, Graduate School of Medicine, University of Pennsylvania, Philadelphia.

HANS KRAUS, M.D., Associate Professor of Clinical Physical Medicine and Rehabilitation, New York University College of Medicine; Attending Physician, Institute of Physical Medicine and Rehabilitation, New York.

JOHN McM. MENNELL, M.B., Lecturer in Medical Orthopedics and Director of Physical Medicine, University of Virginia Medical School; Assistant Professor of Clinical Physical Medicine, Medical College of Virginia, Richmond, Virginia.

ROBERT B. O'CONNOR, M.D. (by invitation), Assistant Professor of Industrial Medicine, Harvard School of Public Health; Medical Director, Loss Prevention Department, Liberty Mutual Insurance Company, Boston.  
MIECZSLAW PESZCZYNSKI, M.D. (by invitation), Assistant Professor of Physical Medicine and Rehabilitation, Western Reserve University; Chief, Department of Physical Medicine and Rehabilitation, Highland View, Cuyahoga County Hospital, Cleveland.

EDWARD B. SCHLESINGER, M.D., Assistant Professor of Clinical Neurological Surgery, College of Physicians and Surgeons, Columbia University; Attending Neurological Surgeon, Neurological Institute of Columbia-Presbyterian Medical Center, New York.

HILDRED SCHUELL, Ph.D. (by invitation), Assistant Professor of Neurology, University of Minnesota, Minneapolis.

OTHMAR SOLNITZKY, M.D., Ph.D. (by invitation), Professor of Anatomy and Director, Department of Anatomy, Georgetown University School of Medicine; Civilian Consultant to Walter Reed Army Medical Center and Mt. Alto VA Hospital, Washington, D.C., and Civilian Consultant to National Naval Medical Center, Bethesda, Maryland.

WALTER M. SOLOMON, M.D., Staff, Cleveland Clinic, Cleveland.

ODON F. von WERSOWETZ, M.D., Medical Director, Gonzales Warm Springs Foundation, Gonzales, Texas.

ARTHUR L. WATKINS, M.D., Medical Co-Director, Physical Therapy Course, Simmons College; Chief, Physical Medicine Department, Massachusetts General Hospital, Boston.

### GENERAL INFORMATION

#### RULES GOVERNING THE READING OF PAPERS

No paper or address before the Congress shall occupy more than fifteen minutes in its delivery. The program is so arranged that all the time is utilized and it is therefore imperative that the stated time schedule be closely followed.

All papers read before the Congress shall become the property of the Congress for publication in the official journal. Each paper shall be deposited with the *assistant officer* of the session when read.

#### THE CONVENTION

The registration desk will be open at 8:00 A.M., Tuesday, September 7 for registration. It is important that everyone register before entering the convention area. Those not wearing the official badge will be refused admission. This meeting is not open to the public. No registration fee will be charged.

#### BUSINESS SESSIONS

The annual business meetings of the general membership of the Congress will be held on Wednesday, September 8, and Thursday, September 9 at 4:30 P.M.

## CONGRESS DINNER

The annual Congress dinner will be held on Thursday evening, September 8, at 7:00 P.M. Dress is optional. Exhibitors and guests are welcome. An interesting but brief dinner program has been arranged. You will enjoy this session, which is the only social function of the meeting.

## THE INSTRUCTION SEMINAR

Courses are offered as previously in two separate groups. However, as a trial this year, the distinction has been eliminated between the basic science group and the clinical group. Each group, and in many cases each lecture, will deal with basic science as well as clinical aspects. Physicians as well as physical therapists who are registered with the American Registry of Physical Therapists will be permitted to register for these courses. Members in good standing of the American Occupational Therapy Association are also eligible to enroll for the seminar.

The schedule of the seminar, as arranged, will permit attendance at both the course and scientific sessions.

Each registrant for the course is allowed the choice of one lecture during a period. The charge for the complete schedule of eight lectures is \$15.00. Fewer than eight lectures may be scheduled at \$2.00 per lecture. The right is reserved to reject any application if the Committee finds it desirable to do so. Registration for specific courses cannot be guaranteed when quotas are filled.

Those who have not completed their registration for the course should do so before attending any of the lectures. No one will be admitted to any of the course lectures without the official registration card for the course. Registration for the course may be completed on Tuesday, September 7, starting at 8:00 A.M., and continuing throughout the week starting at 8:00 A.M. at the main registration desk.

## AMERICAN SOCIETY OF PHYSICAL MEDICINE AND REHABILITATION

The American Society of Physical Medicine and Rehabilitation will hold its annual scientific session, dinner and business meeting on Tuesday, September 7.

## SCIENTIFIC EXHIBITS

Scientific exhibits will be on display again and should prove of great interest. As is customary, medals will be awarded to those exhibits which are adjudged outstanding by the Committee on Awards for Scientific Exhibits and will be announced at the annual Congress dinner.

## TECHNICAL EXHIBITS

The program of the scientific sessions and instruction seminar has been arranged with intermission periods to allow time for visits and inspection of the technical exhibits. As these have been given considerable thought and effort, we urge every member and guest to set aside sufficient time for a complete tour of all exhibits.

Exhibits will be open from 9:00 A.M. to 5:00 P.M., Wednesday, September 8 through Friday, September 10 till 3:30 P.M.

## EDITORIAL BOARD

The annual meeting of the Editorial Board will be held on Sunday, September 5, 4:00 P.M.

## AMERICAN REGISTRY OF PHYSICAL THERAPISTS

The annual meeting of the Boards of the Registry will be held on Wednesday, September 8, 7:00 P.M., at dinner.

## HYDROTHERAPY GROUP

There will be a subscription luncheon meeting for the group interested in hydrotherapy on Wednesday, September 8, at 12:30 P.M.

## VETERANS ADMINISTRATION

Official Third Annual Conference of VA Chief Consultant and Area Consultants, Physical Medicine and Rehabilitation Service, Sunday, September 5, 10:00 A.M.

Sixth Annual VA Luncheon for Chiefs, Acting Chiefs, Assistant Chiefs, Staff Physiatrists, Consultants and Attending Physiatrists of the Physical Medicine and Rehabilitation Service, Saturday, September 11, 12:30 P.M., South American Room. An interesting program has been arranged.

## SCIENTIFIC FILMS

Several scientific films will be shown during the time of the convention.

## SCHEDULE OF DAILY ACTIVITIES

## 32nd ANNUAL SESSION

SUNDAY, September 5

10:00 Meeting, Veterans Administration Consultants (Room to be announced)  
4:00 Meeting, Editorial Board, Michigan Room  
6:30 Dinner, Editorial Board, Ohio Room

TUESDAY, September 7

8:00 Registration, Mezzanine Floor  
9:00 Instruction Seminar, Pan American Room  
9:00 Instruction Seminar, California Room  
9:30 Scientific Session, American Society of Physical Medicine and Rehabilitation, South American Room  
10:00 Instruction Seminar, Pan American Room  
10:00 Instruction Seminar, California Room  
11:00 Instruction Seminar, Pan American Room  
12:00 Luncheon  
12:30 Luncheon, Committee on Advances in Education, American Congress of Physical Medicine and Rehabilitation (by invitation), New York Room  
2:00 Instruction Seminar, Pan American Room  
2:00 Instruction Seminar, California Room  
2:00 Scientific Session, American Society of Physical Medicine and Rehabilitation, South American Room  
3:00 Instruction Seminar, Pan American Room  
3:00 Instruction Seminar, California Room  
4:00 Instruction Seminar, Pan American Room  
4:00 Instruction Seminar, California Room  
4:30 Annual business meeting, American Society of Physical Medicine and Rehabilitation (members only), South American Room  
7:00 Annual dinner, American Society of Physical Medicine and Rehabilitation (members only), South American Room

WEDNESDAY, September 8

8:00 Registration, Mezzanine Floor — Inspection of Exhibits  
8:00 Instruction Seminar, Pan American Room  
8:00 Instruction Seminar, California Room  
9:00 Instruction Seminar, Pan American Room  
9:00 Instruction Seminar, California Room  
9:00 Board of Governors, Congress, Continental Room  
10:00 Scientific Session, Presidential Ballroom  
10:00 Scientific Session, South American Room  
10:00 Scientific Session, Pan American Room  
12:00 Luncheon — Inspection of Exhibits  
12:30 Luncheon, Executive Council (by invitation), Ohio Room  
12:30 Subscription Luncheon, Hydrotherapy Group, California Room  
12:30 Scientific Films, Michigan Room  
2:00 Formal Opening Session, Presidential Ballroom  
4:30 First Congress business meeting (members only), Presidential Ballroom  
7:00 Registry Board Dinner (by invitation), Ohio Room

THURSDAY, September 9

8:00 Registration, Mezzanine Floor — Inspection of Exhibits  
9:00 Scientific Session, Presidential Ballroom  
9:00 Scientific Session, Pan American Room  
10:00 Intermission — Inspection of Exhibits  
10:30 Scientific Session, Presidential Ballroom  
10:30 Scientific Session, Pan American Room  
12:00 Luncheon — Inspection of Exhibits  
12:30 Luncheon, Advisory Committee on Education, Council on Physical Medicine and Rehabilitation, American Medical Association (by invitation), Ohio Room  
12:30 Scientific Films, Michigan Room  
2:00 Scientific Session, Presidential Ballroom  
4:30 Second Congress business meeting (members only), Presidential Ballroom  
7:00 Annual Congress Dinner, Presidential Ballroom

FRIDAY, September 10

8:00 Registration, Mezzanine Floor — Inspection of Exhibits  
9:00 Scientific Session, Presidential Ballroom  
9:00 Scientific Session, Pan American Room  
10:00 Board of Governors, Congress, Continental Room  
10:00 Intermission — Inspection of Exhibits  
10:30 Scientific Session, Presidential Ballroom  
10:30 Scientific Session, Pan American Room  
12:00 Luncheon — Inspection of Exhibits  
12:30 Scientific Films, Michigan Room  
2:00 Scientific Session, Presidential Ballroom

## SATURDAY, September 11

8:30 Registration  
 9:30 Scientific Session, Presidential Ballroom  
 12:30 Veterans Administration Personnel Luncheon, South American Room

## GENERAL SCIENTIFIC SESSION

## WEDNESDAY, September 8 — 10 A.M.

## Presidential Ballroom

Presiding — O. LEONARD HUDDLESTON, Santa Monica, Calif.  
 Assisting — H. WORLEY KENDELL, Peoria, Ill.

10:00 **Prescription for the Long Leg Brace.**  
 DUANE A. SCHRAM, M.D., Chief, Physical Medicine and Rehabilitation, VA Hospital, Seattle.  
 Discussant: Robert Newman, Iowa City

10:20 **The Rejection of Help by Some Disabled People.**  
 IAN EWART ALGER (by invitation), 1st Lt., MC (USA), Chief, NP Consultation Service, Letterman Army Hospital, San Francisco.  
 Discussant: Arthur Abramson, New York

10:40 **The Variations Between Measured and Biologically Effective Microwave Diathermy Dosage.**  
 HERMAN P. SCHWAN, Ph.D. (by invitation), Associate Professor of Physical Medicine, School of Medicine; Associate in Physical Medicine and Rehabilitation, Hospital of the University of Pennsylvania;  
 and  
 KAM LI, B.S., M.S. (by invitation), Research Associate, Department of Physical Medicine, University of Pennsylvania, Philadelphia.  
 Discussant: Ursula Leden, Dallas, Texas

11:00 **Changes in Electromyographic Wave Forms in Relation to Variation in Type and Position of Electrodes.**  
 JOSEPH GOODGOLD, M.D., Clinical Instructor of Physical Medicine and Rehabilitation; Assisting Attending in Physical Medicine and Rehabilitation, University Hospital, New York University-Bellevue Medical Center,  
 and  
 JOSEPH MOLDAVER, M.D., New York.  
 Discussant: Harry T. Zankel, Cleveland

11:20 **An Electromyographic Study of Some of the Muscles of Respiration.**  
 GEORGE H. KOEPKE, M.D. (by invitation), Instructor, Department of Physical Medicine and Rehabilitation, University Hospital;  
 JAMES W. RAE, JR., M.D., Chairman, Department of Physical Medicine and Rehabilitation, University Hospital; Associate Professor and Chairman, Department of Physical Medicine and Rehabilitation, Medical School, University of Michigan;  
 DAVID G. DICKINSON, M.D. (by invitation), Assistant Professor, Department of Pediatrics and Communicable Diseases, University of Michigan Medical School; Director, Poliomyelitis Respirator Center, University Hospital,  
 and  
 ALMA J. MURPHY, Ph.D. (by invitation), Research Assistant, Physical Medicine and Rehabilitation, Medical School, University of Michigan, Ann Arbor, Michigan.  
 Discussant: James G. Golseth, Pasadena, Calif.

11:40 **Conduction Velocity of Motor Nerves in Patients with Neuromuscular Disorders.**  
 JENS D. HENRIKSEN, M.D. (by invitation), Fellow in Physical Medicine and Rehabilitation, Mayo Foundation, Graduate School, University of Minnesota;  
 EDWARD H. LAMBERT, M.D., Ph.D. (by invitation), Associate Professor of Physiology, Mayo Foundation and Section of Physiology, Mayo Clinic,  
 and  
 LEE M. EATON, M.D. (by invitation), Professor of Physiology, Mayo Foundation and Chairman of Sections on Neurology, Mayo Clinic, Rochester, Minnesota.  
 Discussant: Frederic T. Jung, Chicago

## GENERAL SCIENTIFIC SESSION

## WEDNESDAY, September 8 — 10 A.M.

## South American Room

Presiding — EARL C. ELKINS, Rochester, Minn.  
 Assisting — HAROLD DINKEN, Denver

10:00 **Post Hemiplegic Shoulder Pain.**  
 JEROME S. TORIS, M.D., Professor and Director, Department of Physical Medicine and Rehabilitation, New York Medical College; Attending Physician and Director, Department of Physical Medicine and Rehabilitation, Flower and Fifth Avenue Hospitals, New York.  
 Discussant: Louis B. Newman, Chicago

10:20 **Sheltered Workshop for Geriatric Patients within the Hospital.**  
 ROBERT W. BOYLE, M.D., Ph.D., Assistant Professor, Physical Medicine and Rehabilitation Service, Marquette University School of Medicine; Staff Physician in charge of Physical Medicine and Rehabilitation Service, Milwaukee County Hospital, Milwaukee;  
 LOUIS SCHWARTZ, M.D. (by invitation), Chief, Physical Medicine and Rehabilitation Service, VA Hospital, Ft. Thomas, and  
 EDNA LOUISE PROSSER, B.S., O.T.R. (by invitation), Chief Occupational Therapist, VA Hospital, Ft. Thomas, Kentucky.  
 Discussant: Dominic A. Donio, Allentown, Pa.

10:40 **Physical Medicine and Rehabilitation in Private Practice.**  
 FERDINAND F. SCHWARTZ, M.D., Assistant Professor of Clinical Medicine (Physical Medicine), Medical College of Alabama, Birmingham, Alabama.  
 Discussant: Herman L. Rudolph, Reading, Pa.

11:00 **The Use of Hydrotherapy with Detergents as Adjuvants to Wound Therapy.**  
 WILLIAM H. GEORGI, M.D. (by invitation), Fellow, Department of Physical Medicine and Rehabilitation, New York University-Bellevue Medical Center, New York.  
 Discussant: Milton Schmitt, Chicago

11:20 **Rehabilitation Nurse as Coordinator of the Rehabilitation Team.**  
 HENRY V. MORELWICZ, M.D., Assistant Professor, Department of Therapeutics, University of Buffalo Medical School; Director, Department of Physical Medicine, Edward J. Meyer Memorial Hospital, Buffalo, New York.  
 Discussant: Dorothy V. Wheeler (by invitation), Washington, D.C.

11:40 **Economic Factors Relating to the Compensable Back Injury.**  
 ALLEN S. RUSSEK, M.D., New York.  
 Discussant: Bert Treister, Cleveland

## GENERAL SCIENTIFIC SESSION

## WEDNESDAY, September 8 — 10 A.M.

## Pan American Room

Presiding — DONALD A. COVALT, New York  
 Assisting — ISADORE LEVIN, Washington, D.C.

10:00 **Combined Instruction for Physical Therapy and Occupational Therapy Students: Preliminary Report.**  
 VANN S. TAYLOR, Major, MC, Chief, Physical Medicine Section and Assistant Chief, Physical Medicine Branch, Department of Professional Sciences, Medical Field Service School, Brooke Army Medical Center, Fort Sam Houston, Texas.  
 Discussant: Donald L. Rose, Kansas City, Kans.

10:20 **Management of the Industrially Injured Hand.**  
 BRUCE B. GRYNBAUM, M.D., and  
 WILLIAM T. MEDL, M.D. (by invitation), New York.  
 Discussant: Harold Storms, Santurce, P.R.

## 10:40 Cardiac Output During Occupational Therapy Activities.

ARTHUR B. QUIGGLE, M.D. (by invitation);  
FREDERIC J. KOTTKE, M.D., Head, Department of Physical Medicine and Rehabilitation, University of Minnesota Medical School, and  
JEAN NELSON, O.T.R. (by invitation), Minneapolis. Discussant: Arthur A. Rodriguez, Chicago

## 11:00 Physical Medicine in Scalp Disorders.

RUSSELL J. FIELDS, M.D. (by invitation), Chief, Department of Dermatology, Doctors Hospital, Providence Hospital, and Garfield Hospital, Washington, D.C.

Discussant: Charles D. Shields, Washington, D.C.

## 11:20 Treatment of Psoriasis with the Goeckerman Technic.

WALTER M. SOLOMON, M.D., Staff, Cleveland Clinic; EARL W. NETHERTON, M.D. (by invitation), Head, Department of Dermatology, and Staff, Cleveland Clinic; PAUL A. NELSON, M.D., Staff, Cleveland Clinic, and  
WALTER J. ZEITER, M.D., Head, Department of Physical Medicine and Rehabilitation, Cleveland Clinic, Cleveland. Discussant: Leslie Blau, Buffalo

## 11:40 Physical Medicine in the Management of the Painful Shoulder.

DONALD J. ERICKSON, M.D., Consultant, Physical Medicine and Rehabilitation, Mayo Clinic, Rochester, Minnesota.

## GENERAL SCIENTIFIC SESSION

WEDNESDAY, September 8 — 2 P.M.

## Presidential Ballroom

Presiding — WM. BENHAM SNOW, New York  
Assisting — FRANCES BAKER, San Mateo, Calif.

## OPENING OF THE 32nd ANNUAL SESSION

## INVOCATION

Reverend Frederic Brown Harris  
Chaplain to the United States Senate

## ADDRESS OF WELCOME

P. A. McLendon, M.D.  
President, District of Columbia Medical Society

## 2:30 PRESIDENTIAL ADDRESS — The Physiatrist: His Problems, Perspective and Prospects.

WM. BENHAM SNOW, M.D., Professor of Physical Medicine, Columbia University, College of Physicians and Surgeons; Director of Services, Physical Medicine and Rehabilitation, Columbia-Presbyterian Medical Center, New York.

## 2:50 The Management of Chronic Back Disabilities in a Rehabilitation Clinic.

WILLIAM J. SHRIER, M.D., Assistant in Medicine, Harvard University School of Medicine; Assistant in Physical Medicine, Massachusetts General Hospital, and

ARTHUR L. WATKINS, M.D., Medical Director, Bay State Medical Rehabilitation Clinic; Chief, Department of Physical Medicine, Massachusetts General Hospital, Boston.

Discussant: Eugene Moskowitz, Mt. Vernon, N.Y.

## 3:10 A Study of Focal Infection in Rheumatism and Infective Arthritis.

FRANK MAX, M.D. (by invitation), Melbourne, Victoria, Australia.

Discussant: William H. Schmidt, Philadelphia

## 3:30 Essentials of a Residency Training Program in Physical Medicine and Rehabilitation.

HOWARD A. RUSK, M.D., Professor and Chairman, Department of Physical Medicine and Rehabilitation, New York University-Bellevue Medical Center; Director, Institute of Physical Medicine and Rehabilitation, New York University-Bellevue Medical Center;

JOSEPH G. BENTON, M.D., Ph.D., Associate Professor and Coordinator of Education and Research, Department of Physical Medicine and Rehabilitation, New York University-Bellevue Medical Center; Consultant, Institute of Physical Medicine and Rehabilitation, New York University-Bellevue Medical Center;

DONALD A. COVALT, M.D., Associate Professor of Physical Medicine and Rehabilitation, New York University-Bellevue Medical Center; Associate Director, Institute of Physical Medicine and Rehabilitation, New York University-Bellevue Medical Center, and

GEORGE G. DEAVER, M.D., Professor of Clinical Physical Medicine and Rehabilitation, New York University-Bellevue Medical Center; Medical Director, Children's Division, Institute of Physical Medicine and Rehabilitation, New York University-Bellevue Medical Center, New York. Discussant: Robert C. Darling, New York

## 3:50 An Evaluation of Long Wave Diathermy and Microwave Diathermy for Heating the Pelvis.

FREDERIC J. KOTTKE, M.D., Head, Department of Physical Medicine and Rehabilitation, University of Minnesota Medical School, Minneapolis.

Discussant: Carl C. Hoffman, Denver

## 4:10 Use of Occupational Therapy in Physical Rehabilitation.

O. LEONARD HUDDLESTON, M.D., Ph.D., Clinical Professor of Physical Medicine, University of Southern California School of Medicine, Los Angeles; Medical Director, California Rehabilitation Center, Santa Monica, California.

Discussant: Max K. Newman, Detroit

## GENERAL SCIENTIFIC SESSION

THURSDAY, September 9 — 9 A.M.

## Presidential Ballroom

Presiding — WALTER S. McCLELLAN, Chapel Hill, N.C.  
Assisting — FRED B. MOOR, Los Angeles

## 9:00 Functional Significance of Spinal Lesion Level.

CHARLES LONG, II, M.D., Chief, Physical Medicine and Rehabilitation Service, Henry Ford Hospital, Detroit.

Discussant: Keith Keeler, Akron, Ohio

## 9:20 The Influence of Rhythmic Compression on Localized Edema of the Extremity.

FRANK H. KRUSEN, M.D., Professor of Physical Medicine and Rehabilitation, Mayo Foundation; Head of Section on Physical Medicine and Rehabilitation, Mayo Clinic, Rochester, Minnesota;

KHALIL G. WAKIM, M.D., Ph.D. (by invitation), Professor of Physiology, Mayo Foundation, Graduate School of Medicine, University of Minnesota, Minneapolis, and

GORDON M. MARTIN, M.D., Associate Professor of Physical Medicine and Rehabilitation, Mayo Foundation, Graduate School of Medicine, University of Minnesota, Minneapolis; Consultant in Physical Medicine and Rehabilitation, Mayo Clinic, Rochester, Minnesota.

Discussant: Josephine J. Buchanan, Arlington, Va.

## 9:40 Strength Decrement Index, a Measure of Local Muscular Fatigue.

H. HARRISON CLARKE, Ed. D., Research Professor, School of Health and Physical Education, University of Oregon, Eugene, Oregon;

CLAYTON T. SHAY, D.P.E. (by invitation), Acting Director of Graduate Study, Springfield College, and

DONALD K. MATHEWS, D.P.E. (by invitation), Graduate Division, School of Physical Education, Springfield College, Springfield, Massachusetts.

Discussant: Robert W. Boyle, Milwaukee

## INTERMISSION — INSPECTION OF EXHIBITS

## 10:30 Critical Analysis of Divergent Views of Movement at the Shoulder Joint.

ELLEN NEALL DUVAL, Ph.D., Richmond, Virginia.

Discussant: Shelby Gamble, Columbus, Ohio

**10:50 Some Fundamental Characteristics of Tension and Myotatic Impulse Forces in Human Voluntary Muscular Contraction.**

WILLIS C. BEASLEY, Ph.D. (by invitation), Research Biophysicist, Department of Physical Medicine, Children's Hospital, Washington, D.C.

Discussant: Thomas P. Anderson, Hanover, N.H.

**11:10 Ultraviolet Radiation and Cholesterol.**

RUDOLF ALTSCHUL, M.D. (by invitation), Professor of Anatomy, Department of Anatomy and Laboratory of Gerontology, University of Saskatchewan, Saskatoon, Canada.

Discussant: Disraeli Kobak, Chicago

**11:30 The Influence of Various Physical Factors on Ionophoresis Using Radio-Isotopes.**

Y. T. OESTER, M.D., Ph.D., Associate Professor and Acting Chairman, Department of Pharmacology and Experimental Therapeutics, Stritch School of Medicine of Loyola University; Director, Radioisotope Unit, VA Hospital, Hines, Illinois, and

EDWARD P. O'MALLEY, Ph.D. (by invitation), Public Health Service Research Fellow of the National Institutes of Health, Stritch School of Medicine of Loyola University, Chicago.

Discussant: Joshua Ehrlich, Albany, N.Y.

**11:50 Temperature Changes Produced by Spraying with Ethyl Chloride.**

WILLIAM BIERMAN, M.D., Attending in Physical Medicine, Mount Sinai Hospital, and

NORMAN BORKEN, M.D. (by invitation), New York.

Discussant: Isadore Levin, Washington, D.C.

## GENERAL SCIENTIFIC SESSION

THURSDAY, September 9 — 9 A.M.

Pan American Room

Presiding — MILAND E. KNAPP, Minneapolis  
Assisting — ISRAELI KOBAK, Chicago

**9:00 Analysis of Training 400 Above-Knee Amputees.**

WILLIAM J. ERDMAN, II, M.D., Assistant Professor of Physical Medicine and Rehabilitation, University of Pennsylvania School of Medicine, and

EMILIE MAXWELL, M.D. (by invitation), Resident in Physical Medicine and Rehabilitation, University of Pennsylvania Hospital, Philadelphia.

Discussant: Lewis A. Leavitt, Houston, Texas

**9:20 Supportive Appliances in Rehabilitation of Paralytic Hand.**

ODON F. von WERSHOWETZ, M.D., Medical Director, Gonzales Warm Springs Foundation; BETTY S. RIESS, B.A., A.R.P.T. (by invitation), Director, Physical Therapy; ROSE M. ELLIOTT, B.A., O.T.R. (by invitation), Director, Occupational Therapy, and

R. N. WITT, Certified Orthotist (by invitation), Director, Brace Shop, Gonzales Warm Springs Foundation, Gonzales, Texas.

Discussant: Otto Elsner, New York

**9:40 Post-Operative Rehabilitation of Hip Arthroplasties.**

MARGARET M. KENRICK, M.D. (by invitation), Resident, Physical Medicine and Rehabilitation Department, Hospital for Special Surgery, and

K. G. HANSSON, M.D., Associate Professor, Cornell University Medical School; Director, Department of Physical Medicine and Rehabilitation, Hospital for Special Surgery, New York.

Discussant: Louis P. Britt, Memphis, Tenn.

### INTERMISSION — INSPECTION OF EXHIBITS

**10:30 Panel on Geriatrics**

Moderator, MICHAEL M. DACSO, M.D., Assistant Professor of Clinical Physical Medicine and Rehabilitation, New York University College of Medicine; Director, Department of Physical Medicine and Rehabilitation, Goldwater Memorial Hospital, New York.

**Participants:**

LEO DOBRIN, M.D., Visiting Physiatrist, Queens General Hospital, New York;

MURRAY B. FERDERBER, M.D., Assistant Professor of Medicine, University of Pittsburgh, School of Medicine, Pittsburgh;

JOSEPH NOVEY, M.S.W. (by invitation), Project Supervisor, Geriatric Rehabilitation Service, Goldwater Memorial Hospital, Welfare Island, New York, and

EDWARD J. STIEGLITZ, M.D. (by invitation), Lecturer in Industrial Medicine, New York University-Bellevue Post Graduate Medical School, New York; Consulting Internist, Suburban Hospital, Bethesda, Md.; Consultant in Geriatrics, St. Elizabeths Hospital, Washington, D.C.

## GENERAL SCIENTIFIC SESSION

THURSDAY, September 9 — 2 P.M.

Presidential Ballroom

Presiding — FRANK H. KRIESEN, Rochester, Minn.  
Assisting — NATHAN H. POLMER, New Orleans

**2:00 FOURTH JOHN STANLEY COULTER MEMORIAL LECTURE — The History of the American Congress of Physical Medicine and Rehabilitation.**

WALTER J. ZEITER, M.D., Head, Department of Physical Medicine and Rehabilitation, Cleveland Clinic, Cleveland.

**2:20 Breathing Exercise in Pulmonary Disease.**

ALVAN L. BARACH, M.D. (by invitation), Clinical Professor of Medicine, College of Physicians and Surgeons, Columbia University; Associate Attending Physician, Presbyterian Hospital, New York.

Discussant: Erma Smith, Broadview, Ill.

**2:40 Surgery in Cerebral Palsy.**

LEON D. BAKER, M.D., Professor of Orthopaedics, Duke University School of Medicine, Durham, North Carolina.

Discussant: George G. Deaver, New York

**3:00 Poliomyelitis — Its Sequelae: Five Year Follow-Up Survey.**

EARL F. HOERNER, M.D., Harrisburg, Pennsylvania.

Discussant: Herman J. Bearzy, Dayton, Ohio

**3:20 Myositis Ossificans in Poliomyelitis.**

OLAV AUSTLID, M.D. (by invitation), Instructor in Kinesiology, School of Physical and Occupational Therapy, College of Physicians and Surgeons, Columbia University; Assistant Director, Department of Physical Medicine and Rehabilitation, Hospital for Special Surgery, and

K. G. HANSSON, M.D., Associate Professor, Cornell University Medical School; Director, Department of Physical Medicine and Rehabilitation, Hospital for Special Surgery, New York.

Discussant: J. Wayne McFarland, Washington, D.C.

**3:40 Thoraco-Scapular Involvement in Poliomyelitis.**

EUGENE MOSKOWITZ, M.D., Assistant Clinical Professor, Physical Medicine and Rehabilitation, New York University College of Medicine, New York; Director, Physical Medicine and Rehabilitation, Grasslands Hospital, Valhalla, New York, and

ZOFIA K. LASZEWSKI, M.B., Ch.B. (by invitation), Assistant in Physical Medicine and Rehabilitation, New York University College of Medicine, New York.

Discussant: Herbert Park, Richmond, Va.

**3:56 The Physical Therapeutic Management of Peroneal Translocations for Weak Plantar Flexion in Poliomyelitis.**

EARL C. ELKINS, M.D., Consultant, Physical Medicine and Rehabilitation, Mayo Clinic; JOSEPH M. JAMES, M.D. (by invitation), Consultant, Orthopedic Surgery, Mayo Clinic;

EDWARD D. HENDERSON, M.D. (by invitation), Consultant, Orthopedic Surgery, Mayo Clinic, and

JOHN J. MCLEOD, Jr., M.D. (by invitation), Fellow, Orthopedic Surgery, Mayo Foundation, Rochester, Minnesota.

## GENERAL SCIENTIFIC SESSION

FRIDAY, September 10 — 9 A.M.

Presidential Ballroom

Presiding — DONALD L. ROSE, Kansas City, Kans.  
Assisting — FREDERIC J. KOTTKE, Minneapolis

9:00 **Mechanical Factors in the Pathogenesis, Prophylaxis and Therapy of "Fibrosis"** (Fibropathic Syndromes).  
IRVIN NEUFELD, M.D., Associate Attending Orthopedic Surgeon, Metropolitan Hospital, New York.  
Discussant: Jacob L. Rudd, Boston

9:20 **Potential Reversibility of the Hemiplegic Gait.**  
WALTER J. TREANOR, Captain, MC, Assistant Chief of Physical Medicine Service, Letterman Army Hospital;  
RAOUL C. PSAKI, Lt. Col., MC, Chief, Physical Medicine Service, Letterman Army Hospital, and  
ARTHUR E. GRANT, Captain, MC, Physical Medicine Service, Letterman Army Hospital, San Francisco.  
Discussant: Charles Stansky, St. Petersburg, Fla.

9:40 "Picture-Lessons" in Typewriting for Aphasics.  
ROY H. NYQUIST, M.D., Chief of Physical Medicine Section, Paraplegia Service, VA Hospital, and  
GEORGIA CROTHWAITE, B.S. (by invitation), Supervisor-Instructor Therapist, Educational Therapy Section, Physical Medicine and Rehabilitation Service, VA Hospital, Long Beach, California.  
Discussant: Joseph L. Koczur, Chicago

## INTERMISSION — INSPECTION OF EXHIBITS

10:30 **The Use of Ultrasonic Vibration in the Treatment of Pain Arising from Phantom Limbs, Scars and Neuromas: A Preliminary Report.**  
JOHN H. KUTTERT, Lt. Col. MC, Chief, Physical Medicine Branch, Medical Field Service School, and  
DAVID RUBIN, Captain, MC, Instructor, Physical Medicine, Medical Field Service School, Brooke Army Medical Center, Fort Sam Houston, Texas.  
Discussant: Jerome Weiss, Brooklyn

10:50 **Changes in Hydration of Muscle and Tendon Following Application of Ultrasonic Energy.**  
JEROME W. GERSTEN, M.D., Associate Professor, Department of Physical Medicine and Rehabilitation, University of Colorado School of Medicine, Denver.  
Discussant: Fritz Friedland, Boston

11:10 **Biophysical Effects of Ultrasonic Energy on Carcinoma and Their Possible Significance.**  
JUSTUS F. LEHMANN, M.D. (by invitation), Fellow in Physical Medicine and Rehabilitation, Mayo Foundation;  
JULIA F. HERRICK, Ph.D. (by invitation), Staff Member, Section on Biophysics and Biophysical Research, Mayo Clinic, and  
FRANK H. KRUSEN, M.D., Head, Section of Physical Medicine and Rehabilitation, Mayo Clinic, Rochester, Minnesota.  
Discussant: Karl Sollner (by invitation), Bethesda, Md.

11:30 **Changes in Permeability of the Red Blood Cell Membrane in a Homogenous Ultrasonic Field.**  
ROBERT C. DARLING, M.D., Professor of Physical Medicine and Rehabilitation, College of Physicians and Surgeons, Columbia University, and  
MILOS J. LOTA, M.D. (by invitation), Research Assistant in Physical Medicine and Rehabilitation, College of Physicians and Surgeons, Columbia University, New York.  
Discussant: Hans J. Behrend, New York

11:50 **Clinical Application of Ultrasound.**  
ALBERT A. MARTUCCI, M.D., Associate Professor of Physical Medicine, University of Pennsylvania Graduate School of Medicine, Philadelphia.  
Discussant: Ralph E. DeForest, Chicago

## GENERAL SCIENTIFIC SESSION

FRIDAY, September 10 — 9 A.M.

Pan American Room

Presiding — WILLIAM H. SCHMIDT, Philadelphia  
Assisting — WILLIAM D. PAUL, Iowa City

9:00 **Rehabilitation of the Chronic Rheumatoid Arthritis. A Two-Year Report.**  
EDWARD W. LOWMAN, M.D., Clinical Director, Institute of Physical Medicine and Research, New York University-Bellevue Medical Center; Associate Professor of Physical Medicine and Rehabilitation, New York University, College of Medicine, New York.  
Discussant: George D. Wilson, Asheville, N.C.

9:20 **Value of Therapeutic Exercises in Thoracic Surgery.**  
ALBERT HAAS, M.D. (by invitation), Department of Physical Medicine and Rehabilitation, New York University, College of Medicine; Physician in Charge of Chest Rehabilitation, Bellevue Hospital, New York, and  
HOWARD A. RUSK, M.D., Professor and Chairman, Department of Physical Medicine and Rehabilitation, New York University-Bellevue Medical Center; Director, Institute of Physical Medicine and Rehabilitation, New York University-Bellevue Medical Center, New York.

Discussant: Stanley P. Radzynski, Wadsworth, Kans.  
9:40 **Cervical Syndrome Especially the Tension-Neck Problem.**  
EDWARD M. KRUSEN, Jr., M.D., Associate Professor and Chairman, Department of Physical Medicine and Rehabilitation, Southwestern Medical School of the University of Texas, Dallas, Texas.  
Discussant: George C. Twombly, Jr., Denver

## INTERMISSION — INSPECTION OF EXHIBITS

10:30 **Comprehensive Program for Cerebral Palsy in a Community.**  
PAUL A. NELSON, M.D., Staff, Cleveland Clinic, and  
WALTER M. SOLOMON, M.D., Staff, Cleveland Clinic, Cleveland.  
Discussant: Harriet Gillette, Atlanta, Ga.

10:50 **Role of Individual Play Therapy as a Technic of Psychotherapy in Cerebral Palsy.**  
EDWARD J. LORENZE, III, M.D., Assistant Professor of Clinical Medicine (Physical Medicine), Cornell University Medical College, New York; Medical Director, The Burke Foundation, White Plains, New York.  
Discussant: Ben L. Boynton, Chicago

11:10 **Cerebral Palsy: Management of the Neuro-Muscular Disability.**  
CHARLES A. FUREY, M.D., Department of Physical Medicine, Jefferson Medical College, Philadelphia.  
Discussant: Thomas F. Hines, New Haven, Conn.

11:30 **Pharmacotherapeutic Procedures in Cerebral Palsy Adjunct to Physical Medicine.**  
MAX K. NEWMAN, M.D.;  
GEORGE PENDY, M.D. (by invitation), and  
GOODWIN A. KATZKIN, B.S. (by invitation), Detroit.  
Discussant: Morton Marks (by invitation), New York

11:50 **The Contribution of Sister Elizabeth Kenny to the Treatment of Poliomyelitis.**  
MILAND E. KNAPP, M.D., Minneapolis.  
Discussant: Harry W. Mims (by invitation), Warm Springs, Ga.

## GENERAL SCIENTIFIC SESSION

FRIDAY, September 10 — 2 P.M.

Presidential Ballroom

Presiding — A.B.C. KNUDSON, Washington, D.C.  
Assisting — WILLIAM BIERMAN, New York

2:00 **Treatment of the Cervical Root Syndrome: An Overlooked Cause of Disability.**  
RICHARD T. SMITH, M.D., Director, Department of Rheumatology, Benjamin Franklin Clinic, Philadelphia.  
Discussant: Emil J. C. Hildenbrand, Washington, D.C.

2:20 **Some Preventable Complications to Rehabilitation.**  
FLORENCE I. MAHONEY, M.D., Chief, Physical Medicine Rehabilitation Service, VA Medical Teaching Group Hospital, and  
BENJAMIN A. MOELLER, M.D. (by invitation), Acting Chief, Paraplegia Service, VA Medical Teaching Group Hospital, Memphis, Tennessee.  
Discussant: Herbert Kent, Sheppard AFB, Texas

2:40 **The Influence of Electrical Stimulation on Work Output and Endurance of Denervated Muscle.**  
KHALIL G. WAKIM, M.D., Ph.D. (by invitation), Professor of Physiology and Research Consultant, Mayo Foundation and Mayo Clinic, Rochester, Minnesota.  
Discussant: Charles S. Wise, Washington, D.C.

3:00 **Rehabilitation of Cup Arthroplasty.**  
TERRY B. JONES, B.S., A.R.P.T. (by invitation), Assistant Chief, Department of Physical Therapy, College of Medicine, University of Iowa; CAROL LARSON, M.D. (by invitation), Professor and Head, Department of Orthopedic Surgery, College of Medicine, University of Iowa, and  
WILLIAM D. PAUL, M.D., Medical Director, Rehabilitation and Poliomyelitis Unit, College of Medicine, University of Iowa, Iowa City.  
Discussant: Oscar O. Selke, Jr., Houston, Texas

3:20 **Panel on Rehabilitation Centers**  
Moderator, DONALD A. COVALT, M.D., Associate Professor, Department of Physical Medicine and Rehabilitation, New York University College of Medicine; Associate Director, Institute of Physical Medicine and Rehabilitation, New York University-Bellevue Medical Center, New York.

**Participants:**  
ARTHUR C. JONES, M.D., Director, Department of Physical Medicine and Rehabilitation, University of Oregon Medical School; Director, Department of Physical Medicine and Rehabilitation, Good Samaritan Hospital, Portland, Oregon; WILLIAM T. JONES (by invitation), Director of Social Service, Kessler Institute for Rehabilitation, West Orange, New Jersey; HENRY REDKEY, M.A. (by invitation), Consultant on Rehabilitation Centers, Office of Vocational Rehabilitation, Department of Health, Education and Welfare, Washington, D.C., and RALPH E. WORDEN, M.D., Associate Professor of Medicine (Physical Medicine and Rehabilitation), Ohio State University College of Medicine; Director, Ohio State University Rehabilitation Center, University Health Center, Columbus, Ohio.

9:30 **Management of Degenerative Joint Disease of the Knees.**  
THOMAS P. ANDERSON, M.D., Instructor in Physical Medicine and Rehabilitation, Dartmouth Medical School; Director, Department of Physical Medicine and Rehabilitation, Mary Hitchcock Memorial Hospital, Hanover, New Hampshire.

9:40 **Neurological Indications for Cervical Traction Therapy.**  
EUGENE NEUWIRTH, M.D., Great Neck, New York.

9:50 **Recovery of Muscle Function in Paraplegia.**  
HARRY T. ZANKEL, M.D., Chief, Physical Medicine Rehabilitation, Crile VA Hospital, and LEONTINE H. CARRINGTON, B.A., A.R.P.T. (by invitation), Physical Therapy Supervisor, Paraplegia Section, Crile VA Hospital, Cleveland.

10:00 **Place and Function of Auxiliary Services Related to Physical Medicine and Rehabilitation.**  
A. RAY DAWSON, M.D., McGuire VA Hospital, Richmond, Virginia.

10:10 **Motivation for Chronic Neuropsychiatric Patients.**  
CHARLES H. REAGAN, M.D., Chief, Physical Medicine and Rehabilitation Service, VA Hospital, Tuscaloosa, Alabama.

10:20 **A New Approach to Muscle Stretching.**  
EDITH LIND KRISTELLER, M.D., Instructor, Department of Physical Medicine and Rehabilitation, New York University, College of Medicine, and IRMGARD BARTENIEFF (by invitation), Chief Physical Therapist, Poliomyelitis Service, Willard Parker Hospital, New York.

10:30 **Myositis Ossificans Complicating Poliomyelitis.**  
JOSEPH P. STOJKOVIC, M.D., (by invitation), Resident in Internal Medicine, College of Medicine, University of Iowa; MICHAEL BONFIGLIO, M.D. (by invitation), Assistant Professor, Department of Orthopedic Surgery, College of Medicine, University of Iowa, and WILLIAM D. PAUL, M.D., Medical Director, Rehabilitation and Poliomyelitis Unit, College of Medicine, University of Iowa, Iowa City.

10:40 **Rehabilitation of Varicose Ulceration.**  
CHRISTIAN E. RADCLIFFE, M.D. (by invitation), Assistant Professor of Dermatology and Syphilology, College of Medicine, University of Iowa, and WILLIAM D. PAUL, M.D., Medical Director, Rehabilitation and Poliomyelitis Unit, College of Medicine, University of Iowa, Iowa City.

10:50 **Setting Up a Physical Medicine and Rehabilitation Service in a New Psychiatric Hospital.**  
JACOB L. RUDD, M.D., Chief, Physical Medicine and Rehabilitation, Brockton VA Hospital, Brockton, Mass.; Chief, Physical Medicine and Rehabilitation, Boston City Hospital, Boston.

11:00 **Effect of Piromen on Spasticity in Cases of Spinal Cord Injury.**  
ERNEST BORS, M.D. (by invitation), Chief, Paraplegia Service, VA Hospital, Long Beach, California, and ROY H. NYQUIST, M.D., Chief of Physical Medicine Section, Paraplegia Service, VA Hospital, Long Beach, Calif.; Instructor in Physical Medicine, University of Southern California, Los Angeles.

## SCIENTIFIC EXHIBITS

**Progress of American Spas and Health Resorts.** Committee on Balneology and Health Resorts: HANS J. BEHREND, M.D., Chairman; WILLIAM BIERMAN, M.D.; K. G. HANSSON, M.D.; WALTER S. McCLELLAN, M.D.; DUANE A. SCHRAM, M.D.; FERDINAND F. SCHWARTZ, M.D., and SAMUEL A. WARSHAW, M.D.

**Function of the Serratus Anterior: A Clinical Study of Chest Surgical Patients.** JACOB GOLDBERG, M.D., and HARRY B. DOPPELT, B. S.

**Use of Plastics for Orthopedic and Prosthetic Appliances.** EDWARD E. GORDON, M.D.; CHARLES R. GOLDSTEIN, and ROBERT MITCHELL.

**Results in Rehabilitation of the Severely Disabled—Medical and Vocational Follow-up.** MORTON HOBERMAN, M.D.; BENJAMIN LIPTON, M.A., and BERNARD TESCHNER, M.D.

**Occupational Therapy in Physical Rehabilitation.** O. LEONARD HUDDLESTON, M.D.

**Respiratory Care in the United States Air Force.** HERBERT KENT, CAPT., (MC).

**FDA Regulation of Medical Devices.** IRVIN KERLAN, M.D., and ROBERT B. HELLER, Ph. D.

## GENERAL SCIENTIFIC SESSION

SATURDAY, September 11 — 9:30 A.M.

Presidential Ballroom

Presiding — ARTHUR C. JONES, Portland, Ore.  
Assisting — CHARLES S. WISE, Washington, D.C.

**PAPERS WILL BE LIMITED TO TEN MINUTES**

9:30 **Management of Degenerative Joint Disease of the Knees.**  
THOMAS P. ANDERSON, M.D., Instructor in Physical Medicine and Rehabilitation, Dartmouth Medical School; Director, Department of Physical Medicine and Rehabilitation, Mary Hitchcock Memorial Hospital, Hanover, New Hampshire.

9:40 **Neurological Indications for Cervical Traction Therapy.**  
EUGENE NEUWIRTH, M.D., Great Neck, New York.

**Evaluating the Patient's Abilities.** A. B. C. KNUDSON, M.D., AND STAFF, PHYSICAL MEDICINE & REHABILITATION SERVICE, VETERANS ADMINISTRATION.

**Medical Rehabilitation for Independence.** A. B. C. KNUDSON, M.D., AND STAFF, PHYSICAL MEDICINE & REHABILITATION SERVICE, VETERANS ADMINISTRATION.

**Rehabilitation in Poliomyelitis.** NATIONAL FOUNDATION FOR INFANTILE PARALYSIS.

**Physical Therapy in Dermatology.** C. E. RADCLIFFE, M.D., AND W. D. PAUL, M.D.

**The Rehabilitation of the Psychiatric Patient.** DELILAH RIEDER, M.D.; JAMES N. BURROWS; RAYMOND E. NILSON; CHARLES M. KINNARD; DOROTHY B. DICKENS; RAYMOND W. SLATER, and O. W. FERL.

**Mechanical Substitutes for Paralyzed Muscles.** LOUIS N. RUDIN, M.D., AND DANIEL J. CRONIN.

**Assistive Supports in Rehabilitation of Paralytic Hand.** ODON F. von WERSOWETZ, M.D.; ROSE ELLIOTT, O.T.R., and BETTY SCHLOSSER BIESS, A.R.P.T.

**Multiple Fellowship on Orthopedic Appliances.** JOHN L. YOUNG, Ph. D., AND COLLABORATORS, MELLON INSTITUTE.

## TECHNICAL EXHIBITS

**AMERICAN HOSPITAL SUPPLY CORP.—Booth 26**

Scientific Products Division, American Hospital Supply Corporation will exhibit the new Monaghan Universal Model Portable Respirator; the improved Bennett Respiratory Ventilation Meter for fast, easy and accurate breathing measurements, and the Tomac Rocking Bed for use in polio convalescence and adaptable for the treatment of peripheral vascular disease.

**BATROW LABORATORIES, INC.—Booth 45**

We are looking forward to a visit from our friends and present users, as well as any member of the Physical Medicine and Rehabilitation group, who may be curious about or interested in our high voltage, microampere type of muscle stimulator.

**BENSON & HEDGES—Booth 40**

**THE BIRTCHE CORP.—Booths 23 and 24**

You are cordially invited to visit our booth, where representatives will be happy to answer questions regarding our products. Featured will be the new portable Ultrasonic unit, #U-103, "Megason," which incorporates all the latest developments in ultrasonics, as well as the new sinewave muscle stimulator, "Myosynchron." Other physical therapy modalities will be displayed.

**THE BURDICK CORP.—Booths 31 and 32**

The Burdick Corporation will exhibit their line of electro-medical equipment, including diathermy apparatus, ultraviolet and infra-red lamps and electrical stimulation equipment. A feature of special interest will be the Burdick Ultrasonic apparatus.

**S. H. CAMP AND CO.—Booth 15**

Being featured at booth 15 are Hoke type poliomyelitis supports, the new Camp Plastic Cervical, Goldthwait, Taylor and Chairback braces—supports that are designed expressly for both men and women, with the magic web adjustment to use in cases of back syndrome. Have you seen the Camp Varco Pelvic Traction Belt, or tried the Head Halter? Experts from our staff will be on hand to answer questions.

**CHATTANOOGA PHARMACAL CO., INC.—Booth 13**

**THE HYDROCOLLATOR STEAM PACK** will be exhibited. This efficient modality simplifies the application of effective moist heat. The HYDROCOLLATOR provides effective thermotherapy, without investment in costly, complicated machines. In the hospital and clinic, the HYDROCOLLATOR Master Unit automatically maintains a ready-to-use supply of steam packs. In the home, the steam pack is readily heated in any convenient vessel of water on the stove.

**THE COCA-COLA CO.—Booth 28**

Ice cold Coca-Cola will be served through the courtesy and cooperation of the Washington Coca-Cola Bottling Works, Inc., and The Coca-Cola Company.

**COSMEVO SURGICAL SUPPLY CO.—Booth 25**

Cosmevo's exhibit displays the AMBUL-AIDER, an appliance designed for restoring early locomotion in amputees;

the P. A. BRACE, adjustable walking braces affording orthopedically-correct ischial traction; the newly-perfected DROP FOOT BRACES for children and adults; ADJUSTABLE CRUTCHES, and many other new items.

**DALLONS LABORATORIES, INC.—Booths 18 and 19**

The Dallons Laboratories, Inc. will display their latest models of the Medi-Sonar ultrasonic generators. A complete crystallographic display will illustrate the piezo-electric effect. Latest reprints and charts will be available. The Mediatherm and Mediquart lines of diathermy and ultraviolet generators will also be shown. We will welcome your visit to our booth.

**EVEREST AND JENNINGS, INC.—Booth 20**

Displayed will be modern wheel chairs in the latest design as an aid to the rehabilitation of those who have lost the power of locomotion.

**GENERAL ELECTRIC CO., X-RAY DEPT.—Booth 30**

Whatever your needs, you can put your confidence in General Electric, manufacturers of complete x-ray equipment—from portable diagnostic to 2,000,000 volt therapy apparatus, electrocardiographs, diathermy, x-ray accessories and supplies. Service is available to you through more than 60 offices throughout the United States and Canada.

**J. E. HANGER, INC.—Booth 22**

Modern prosthetic devices for upper and lower extremity amputees will be displayed by the Hanger organization, who offers a nation-wide service to the amputee. In attendance will be a representative ready to demonstrate the advantages of the Hanger Suction Socket Limb and improvements available for the upper extremity amputee.

**HANOVIA CHEMICAL & MFG. CO.—Booth 21**

Featured in our exhibit will be our new Infrared lamp and our new diathermy equipment. In addition, we will exhibit our self-lighting orificial and general body irradiation lamps, black light for diagnostic work. Competent representatives will be on hand to greet you.

**HILL LABORATORIES CO.—Booth 5**

ANATOMOTOR traction table, combining rolling traction with complete stretching traction; TROPODORES—an effective and efficient apparatus scientifically designed to produce artificial heat in localized areas, continuously and for prolonged periods, with rigid heat controls to a fraction of a degree Fahrenheit, using either dry or humid air, and TERRAPLASTIC, a reusable, porous, plastic poulticing mass having greater efficiency, will be on display.

**ILLE ELECTRIC CORP.—Booth 11**

**HYDROMASSAGE SUBAQUA THERAPY EQUIPMENT.** Ille Electric Corporation will demonstrate in Booth 11 how the care of infantile paraparesis, arthritis, and other disabling conditions can be greatly improved by the use of Hydromassage Subaqua Therapy Tanks. They will display a Mobile Whirlpool Bath with Mobile Adjustable High Chair and Paraffin Bath.

**PAUL E. JOHNSON MFRS. INC.—Booth 1**

Luminous-Infrared Ray Lamps using a NON-METALLIC Infrared ray element in wattages from 450 to 1450—five models; combination Lamps using Luminous-Infrared Ray element and carbon arc mechanisms or cortex ultraviolet burners; Low Volt Therapy Units in three models, and Crusader and Trav-ler Short Wave Diathermies will be on exhibit.

**LA BERNE MANUFACTURING CO., INC.—Booth 38**

LaBerne will exhibit their standing (walk-off) physical therapy table. This table is designed for the treatment of polio, paraplegic and other types of physical therapy patients. Incorporated in its design is adjustable footboard, adjustable restrainer straps, adjustable cervical bar for body traction, adjustable arm sling attachment for arm and hand exercise, adjustable crutches for balance and instructing the patient in their use. The LaBerne Table is electrically operated with push-button control switch and calibrated dial for degree of tilt.

**THE LIEBEL-FLARSHEIM CO.—Booth 10**

The Liebel-Flarsheim Company, Cincinnati, Ohio, manufacturers of electromedical equipment for over thirty-five years, cordially invites you to visit Booth 10, in which their latest short-wave diathermy apparatus will be available for examination and demonstration. Capable representatives will be on hand at all times, and we hope you will stop by so that we may become acquainted.

**R. J. LINDQUIST CO.—Booth 35**

New techniques in ultrasound therapy will be demonstrated with CHRONOSONIC ULTRASOUND INSTRUMENTS in Booth 35 by R. J. Lindquist Company of Los Angeles.

**MEDCO PRODUCTS CO.—Booth 43**

The MEDCOLATOR Stimulator, for the stimulation of innervated muscle or muscle groups ancillary to treatment by massage, is a low volt generator that will generate plenty of your interest. Electrical muscle stimulation is a valuable form of rehabilitation therapy. Be sure to visit our booth for a personal demonstration.

**THE MEDITRON CO.—Booths 2 and 14**

Of particular interest this year is the Meditron Table Model Electromyograph as well as the Meditron Constant Current Chronaximeter. These instruments, when combined in a console cabinet, provide the physiatrist with a complete electro-diagnostic instrument. You are cordially invited to visit our booths and see the complete line of Meditron electro-diagnostic instruments.

**MILES REPRODUCER CO., INC.—Booth 16**

Case histories, lectures and dictation may now be recorded at a 60-foot radius with Walkie-Recordall, an eight pound self-powered battery recorder-transcriber. It operates in or out of the closed briefcase, indoors or outdoors, while stationary, walking, riding or flying. The Voice-Activated Self-Start-Stop feature automatically starts and stops the recording from microphone or telephone, thus eliminating supervision and the recording of silent periods. While facilities for transcribing are available, transcription may be eliminated due to ease of handling identifiable, compact, indexed recordings without the delay of rewinding. Up to 8 hours of permanent recordings may be accumulated at intervals on an "endless" belt costing 25 cents.

**MOORADIAN HIGH FREQUENCY LABS.—Booth 8**

You are cordially invited to see the finest in Short Wave Diathermy equipment, as well as the Castrovejo electro surgical spark gap type precision Coagulator and Desiccator.

**PAUST MFG. CO.—Booth 41**

The new PAUST ELECTRONIC STIMULATOR MODEL 50C will be shown and demonstrated. Be sure to see this Electrical Muscle Stimulator for adjunct therapy in strains, sprains, dislocations and other trauma of the musculoskeletal system, muscle atrophy, need of muscle re-education, re-establishment of muscle sense. Precision engineered. Merits checking by all interested in electrical muscle stimulation.

**POOR & LOGAN MFG. CO.—Booth 37**

The Vaso-Pneumatic—"VP"—fulfills the long felt need for a reliable method of ACTIVELY and DIRECTIONALLY increasing the flow of blood and tissue fluids in the extremities. It is the only instrument using nature's own efficient means of moving such fluids—the peristaltic pressure wave.

**PORTO-LIFT MFG. CO.—Booth 17**

PORTO-LIFT—The original and the leader in scientific equipment for lifting, transferring and rehabilitating bed patients. Its smooth, hydraulic action means freedom from strain to attendant and complete satisfaction and comfort for the patient. With the adjustable base, the PORTO-LIFT may be used in every room including the bathroom. With the bathtub fixture, a patient may be transferred to bath with ease. The trying task of transfer to auto also becomes easy with the aid of the PORTO-LIFT.

**J. A. PRESTON CORP.—Booth 3**

J. A. Preston Corporation offers a complete line of physical therapy equipment and is showing a selection of interesting equipment for rehabilitation. Included are several newly developed items shown for the first time. Also on exhibit will be electro-medical apparatus, exercise equipment, whirlpools, new type walkers, diagnostic apparatus, cerebral palsy equipment, and self-help devices.

**RADIOLOGICAL CORP. OF AMERICA—Booth 4**

Radiological Corporation of America, Orange, N.J., will exhibit in Booth 4 the Siemens physical therapy apparatus, including the Siemens SONOSTAT units.

**REHABILITATION EQUIPMENT, INC.—Booth 33**

Better equipment for physical medicine, including the new ADJUSTOMATIC TABLE FOR STANDING AND WEIGHT BEARING—COMFIT-EZE URINAL—FULLY ADJUSTABLE PARALLEL BARS—RESISTIVE EXERCISE EQUIPMENT—BATHROOM AIDS, Air Foam Toilet Seat, Bath Rails, Raised Toilet Seat, Safety Grips—CEREBRAL PALSY APPARATUS—Equipment designed and custom built to fulfill your individual requirements.

**THE RIES CORP.—Booth 12**

The MOISTAIRE unit delivers a safe, comfortable moist heat, either locally or generally, to the human body at the exact prescribed temperature. For years, leading physicians have used it for low back conditions, post fracture care, arthritis, bursitis, convalescent poliomyelitis, peripheral vascular diseases and other industrial and orthopedic problems.

**SARATOGA SPRINGS AUTHORITY—Booth 6**

The Saratoga Spa—one of New York State's health assets. This new exhibit will answer for the physicians two questions: What is Spa Therapy and its medical indications? What is

an approved Spa? It also emphasizes that a health vacation is good preventive medicine. An attendant will distribute Saratoga Spa literature.

**TECA CORP.—Booth 29**

We are pleased to present TECA Low Volt Generators, the most advanced units on the market today for stimulation of normal and denervated muscles. Featured is the low-priced Portable Generator with Variable Frequencies, Model SP2, designed especially for the general practitioner. See also a demonstration of the new Chronaxie Meter for electro-diagnosis.

**THERMO-ELECTRIC CO.—Booth 9**

On exhibit will be the Dickson Paraffin Baths, which were pioneered and developed in cooperation with Cleveland hospitals. The Dickson Paraffin Baths have been in continuous use, in these hospitals, for the past ten to fifteen years. Unusual features of the apparatus are mahogany mouldings designed for the comfort of the patient; double control of the melting element insuring maximum safety, and a patented drain. Three models will be shown.

**TRU-EZE MFG. CO.—Booth 34**

TRACTION AT HOME . . . Our representatives will welcome the opportunity to demonstrate how your patients can continue using cervical, pelvic or extremity traction after hospital release. With TRU-EZE Traction Sets, the less severely injured, after proper instructions, can be encouraged to continue treatment at home. Ethically promoted, these simple and economical traction items are available on prescription only.

**ULTRASONIC MEDICAL EQUIPMENT CORP.—Booth 38**

Ultrasonic Medical Equipment Corporation will show 5 models of their Ultrasonic equipment in all price classes. Of special interest should be the INDICATOR-LIGHT built into the transducer (patent applied for) which proves positive radiation of Ultrasound into the tissue.

**FELIX B. WEINBERG—Booth 42**

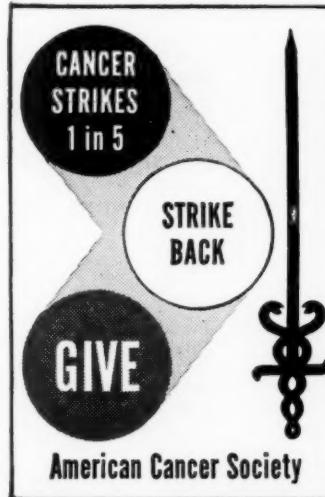
We make sculptured, mirror image eye-lid-cheek, ear and nose prostheses, as well as shoulders and pads for atrophied calf muscles which are comfortable, realistic and restore natural symmetry to the face and body. Since 1946, we have made life-like seamless vinyl plastic hands, adapting them to the use of amputees.

**THE WHITEHALL ELECTRO MEDICAL CO., INC.—Booth 7**

The Whitehall One-Motor Whirlpool Bath will be on exhibit—this is the whirlpool with the turbine assembly that functions both as agitator and emptying device—no separate drainage system is necessary. Whitehall manufactures a complete line of hydrotherapy equipment from small foot models to Hubbard Tanks.

**ZIMMER MFG. CO.—Booth 39**

The Zimmer Manufacturing Company will exhibit a new device for measuring muscle strength, the Newman Myometer as well as the Gable-McKinney Walker, protractors, the Haskell Cervical Traction Unit and many other items.



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THE AMERICAN ASSOCIATION OF ELECTROMYOGRAPHY  
AND ELECTRODIAGNOSIS

Annual Scientific Session

Sunday, September 5, 1954

Hotel Statler, Washington, D. C.

9:00 A.M. Registration

9:30 A.M. TERMINOLOGY AND DEFINITIONS IN ELECTRODIAGNOSIS. Joseph Moldaver, New York.  
ELECTROMYOGRAMS AS OPINION EVIDENCE. James Golseth, Pasadena, Calif.  
ELECTROMYOGRAPHY AND CERTAIN DRUGS ACTING ON THE MYONEURAL JUNCTION. J. Polli and Y. Thomas Oester, Chicago.  
THE ELECTRICAL ACTIVITY OF THE TEMPORAL AND MASSETER MUSCLES IN MAN DURING ROTATION OF THE HEAD. Samuel Pruzansky (by invitation), Chicago.  
THE MYOTONIAS: ELECTROMYOGRAPHIC OBSERVATIONS. Paul Shea, San Diego, Calif.  
ELECTROMYOGRAPHIC FINDINGS IN PARAMYOTONIA CONGENITA. William J. LaJoie, Phoenix.

LUNCHEON

1:30 P.M. THE ELECTROMYOGRAPH AS A DIAGNOSTIC AID IN LESIONS INVOLVING THE UPPER EXTREMITY. Francis J. Bonner, Ardmore, Pa., and William Schmidt, Philadelphia.  
ELECTROMYOGRAM IN POLYMYOSITIS AND DERMATOMYOSITIS. Edward H. Lambert; George T. Sayre, and Lee M. Eaton, Rochester, Minn.  
ELECTROMYOGRAPHIC FINDINGS IN DERMATOMYOSITIS, Y. Thomas Oester and Arthur A. Rodriguez, Chicago.  
ALTERATIONS IN THE MASTICATORY MECHANISM AS A CONSEQUENCE OF BULBAR POLIOMYELITIS. Samuel Pruzansky, (by invitation), Chicago.  
ELECTROMYOGRAM IN DIFFERENTIAL DIAGNOSIS OF CERVICAL NEUROLOGICAL SYNDROMES. S. Berryman, Beverly Hills, Calif.  
CLINICAL EVALUATION OF ELECTROMYOGRAPHY IN CERVICAL ROOT COMPRESSION SYNDROME. Max K. Newman, Detroit.  
FURTHER EXPERIENCES WITH THE ELECTROMYOGRAPH IN THE SPINAL NERVE ROOT COMPRESSION SYNDROME. Paul Shea, San Diego, Calif.

4:30 P.M. BUSINESS MEETING.

6:30 P.M. SOCIAL HOUR AND DINNER FOR MEMBERS AND GUESTS.

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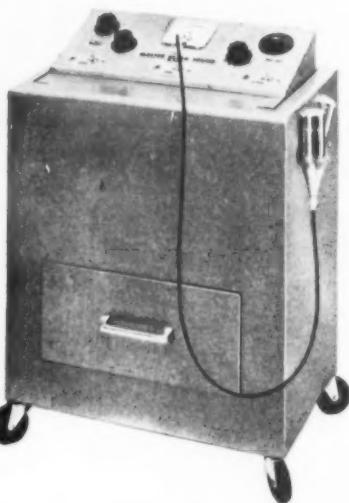
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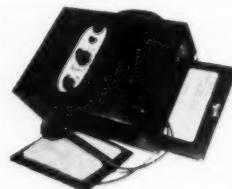
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# INSTRUCTION SEMINAR

in conjunction with the

## 32nd Annual Scientific and Clinical Session

### American Congress of Physical Medicine and Rehabilitation

HOTEL STATLER

— September 6 - 11, 1954 —

WASHINGTON, D.C.

#### HEMIPLEGIA

*Tuesday, September 7*

9:00 - 9:50 A.M. PHYSIOLOGY OF CEREBRAL CIRCULATION. Seymour S. Kety, M.D., Bethesda, Md.

10:00 - 10:50 A.M. ANATOMY OF CEREBRAL CIRCULATION. Othmar Solnitzky, M.D., Washington, D.C.

11:00 - 11:50 A.M. ACUTE MANAGEMENT OF HEMIPLEGIA AND PREVENTION OF DEFORMITIES. A. David Gurewitsch, M.D., New York.

2:00 - 2:50 P.M. GAIT TRAINING FOR THE HEMIPLEGIC. Mieczyslaw Peszczynski, M.D., Cleveland.

3:00 - 3:50 P.M. PROSPECTS FOR THE HEMIPLEGIC ARM. Edward E. Gordon, M.D., New York.

4:00 - 4:50 P.M. PRACTICAL MANAGEMENT OF APHASIA. Hildred Schuell, Ph.D., Minneapolis.

*Wednesday, September 8*

8:00 - 8:50 A.M. ACTIVITIES OF DAILY LIVING FOR THE HEMIPLEGIC PATIENT INCLUDING SELF-HELP DEVICES. Donald A. Covalt, M.D., New York.

9:00 - 9:50 A.M. VOCATIONAL PROSPECTS FOR THE HEMIPLEGIC. James F. Garrett, Ph.D., Washington, D.C.

#### PAINFUL LOW BACK

*Tuesday, September 7*

9:00 - 9:50 A.M. FUNCTIONAL ANATOMY OF THE SPINE. Othmar Solnitzky, M.D., Washington, D.C.

10:00 - 10:50 A.M. MANAGEMENT OF ACUTE LOW BACK PAIN WITHOUT RADICULAR PATHOLOGY. Hans Kraus, M.D., New York.

11:00 - 11:50 A.M. MANIPULATIVE TECHNIQUES OF THE SPINE AND INDICATIONS FOR USE. John McM. Mennell, M.B., Richmond, Va.

2:00 - 2:50 P.M. BACK BRACES. Odon F. von Werssowetz, M.D., Gonzales, Texas.

3:00 - 3:50 P.M. DIAGNOSIS AND INDICATIONS FOR SURGERY IN DISC DISEASE. Edward B. Schlesinger, M.D., New York.

4:00 - 4:50 P.M. BACK PAIN AND DISABILITY AS A COMPENSATION PROBLEM. Robert B. O'Connor, M.D., Boston.

#### OSTEOARTHRITIS

*Wednesday, September 8*

8:00 - 8:50 A.M. PATHOGENESIS AND MEDICAL MANAGEMENT. Walter M. Solomon, M.D., Cleveland.

9:00 - 9:50 A.M. THERAPY IN PHYSICAL MEDICINE. Arthur L. Watkins, M.D., Boston.

Note: The Committee on Advances in Education of the American Congress of Physical Medicine and Rehabilitation is in charge of the instruction seminar. It is purposely planned to limit the subjects this year to three which will be covered in considerable detail both from clinical and basic science points of view. It is normally planned that the larger and more important subjects will be repeated every three to five years.

Courses are offered as previously in two separate groups. However, as a trial this year, the distinction has been eliminated between the basic science group and the clinical group. Each group, and in many cases each lecture, will deal with basic science as well as clinical aspects. Physicians as well as physical therapists who are registered with the American Registry of Physical Therapists will be permitted to register for these courses. Members in good standing of the American Occupational Therapy Association are also eligible to enroll for the seminar.

The schedule of the seminar, as arranged, will permit attendance at both the course and scientific sessions.

Each registrant for the course is allowed the choice of one lecture during a period. The charge for the complete schedule of eight lectures is \$15.00. Fewer than eight lectures may be scheduled at \$2.00 per lecture. The right is reserved to reject any application if the Committee finds it desirable to do so. Registration for specific courses cannot be guaranteed when quotas are filled.

*For full information and application form address*

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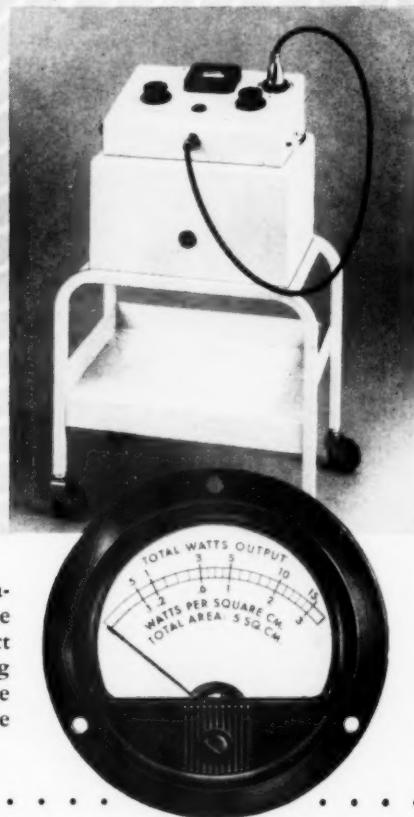
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